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AUTOMOTIVE INDUSTRIES

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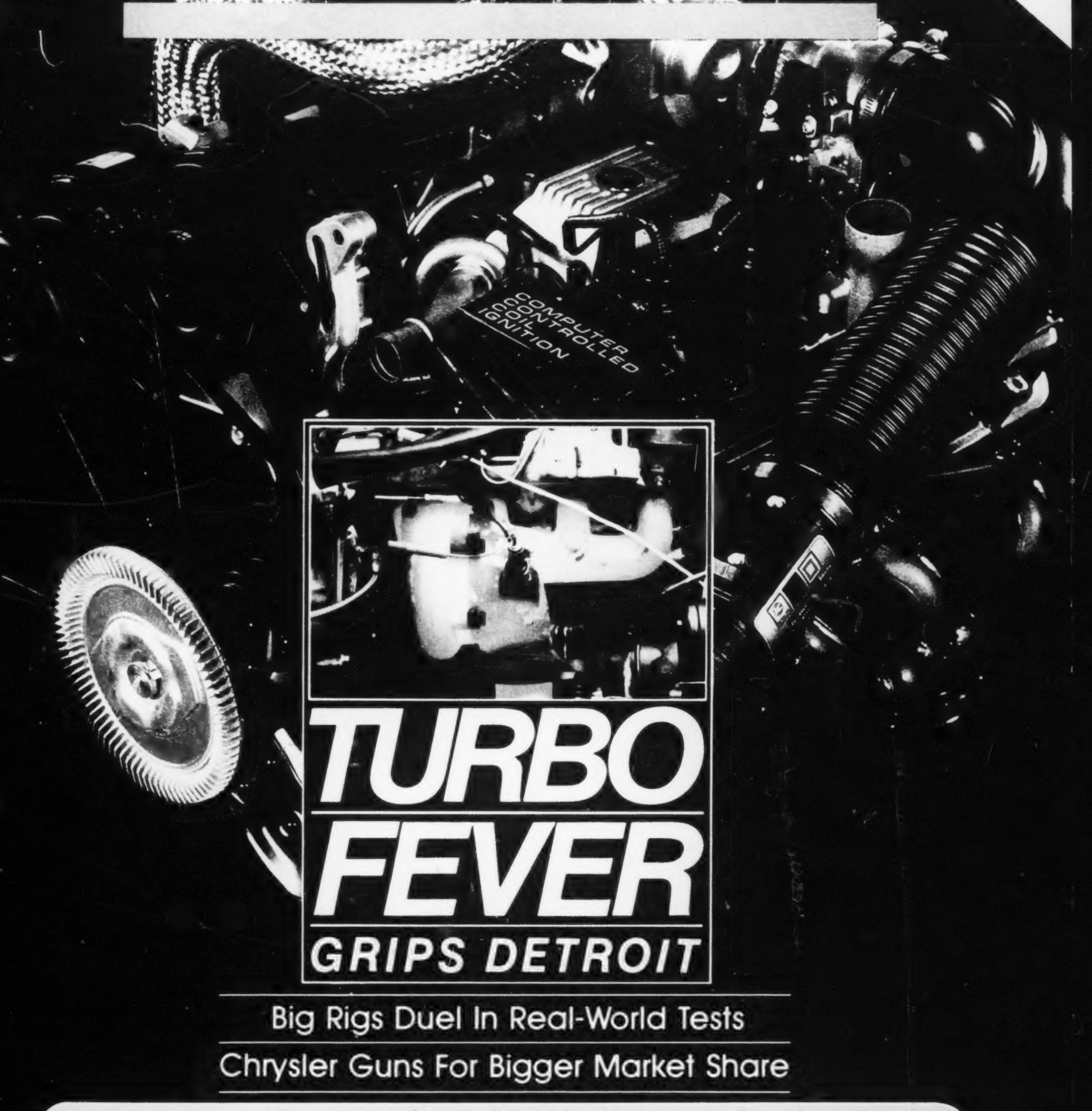
Chilton's TRUCK & OFF-HIGHWAY INDUSTRIES


COMPUTER
CONTROLLED
COIL
IGNITION

TURBO FEVER GRIPS DETROIT

Big Rigs Duel In Real-World Tests

Chrysler Guns For Bigger Market Share

Including **Truck & Off-Highway Industries**

AUTOMOTIVE INDUSTRIES

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QUOTABLE

Ford Chairman Philip Caldwell, describing new investments in products, plants and machinery by the auto industry: "The cost of this industrial revolution is $80 billion which happens to be more than it took to land a man on the moon. I like to compare it to the total cost in today's dollars of the Marshall Plan, which put Western Europe back on its feet after World War II...although, unlike the Marshall Plan, virtually every dollar for the automobile revolution is coming from private capital."

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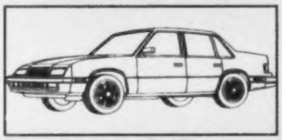

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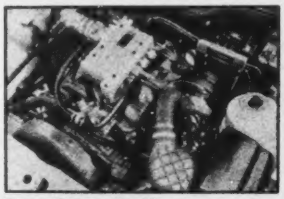

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AI MARKETDATA

The Cycle Turns Rag

Citicorp economists are cautioning that the recovery will continue to be decidedly uneven, but car sales look good, according to economist John Maher. Maher sees sales rising next year to an average 10.5 million units, with an 8.0/2.5 million domestic/import split, and says the numbers are attainable in spite of the expected fall-off late this year and early next year. Auto sales should exceed an 11 million unit annual rate for a few quarters, according to Citicorp projections, but escalating inflation should lead the Fed to reduce money growth, resulting in a recession in late 1985/early 1986. Maher says the cyclical downturn will be a relatively mild one, but the subsequent recovery will be mild too, since the Federal Reserve will act to cool it down so that inflation doesn't become a problem.

New Car Sales (millions, seasonally adjusted)

	1983	1984	1985	1986	1987	1988
total sales	9.3	10.5	11.0	9.5	10.5	11.0
domestic	6.9	7.9	8.3	7.0	7.8	8.3
import	2.4	2.5	2.7	2.5	2.7	2.7
import share (%)	25.5	24.1	24.1	26.2	25.3	24.5

Source: Citibank Economics Dept.

Fastening Up

Sales of industrial fasteners should gain considerable strength through 1987, says Frost & Sullivan. Volume in 1983 is projected to jump to $4.4 billion in constant dollars from last year's $3.9 billion. For the next 4 years, says the report, growth will average 5% per year, yielding a $5.2 billion market in 1987. Sales in the adhesives market will approach $900 million by 1987.

Cybernetic Premiums

What happens when a member of your robot tribe breaks an arm or fries a few transistors? If you've taken out an insurance policy on your steel collar invalid, you collect, that's what. The Kemper Group has dropped the exclusion for process control computers from its boiler and machinery policy so that the complete robot can be covered for equipment breakdown and expenses incurred from interruption of business caused by the loss.

Ford Taps Europe

Ford US may sell more than just European Sierras next year. The redesigned European Granada is also being eyed for US consumption. Ford has substantiated the rumors that its 2.3-L turbo will replace the European 2.8-L V6 in Sierras arriving in Lincoln-Mercury dealer showrooms next year.

Allied Advance

Allied Corp.'s Automotive Sector has combined several divisions to create what the company calls one of the largest independent suppliers of electrical and electronic products to the worldwide automotive industry. The new organization combines Bendix Engine Controls Div., Newport News, VA, Canadian Fram Inc., Chatham, Ont. and twelve Prestolite operations in North America and one in the UK. Renix Electronique, a joint venture between Bendix and Renault, will be an affiliated member of the combine. Additionally, Prestolite's spark plug business has been combined with the Autolite spark plug unit, also a member of Allied Automotive.

Mergers Down

Believe it or not, merger and acquisition activity in the auto and truck industry decreased 14% in 1982, according to W.T. Grimm & Co., a merger and acquisition authority. The firm reports auto and truck industry mergers fell from seven in 1981 to six in 1982, placing the industry 49th on W.T. Grimm's 50-industry list.

Market Minutiae

Volvo's new US Bus Division recently received its **first order** for 50 transit buses to be delivered next summer to the Southeastern PA Transportation Authority. ■ Mack Trucks Inc. is **increasing production** at its Allentown, PA plant to 79 trucks per day. The recent increase, coupled with increases last July, raises production rates 40% since June 30. ■ Marik Bosia has been **named president** and CEO of Fiat Motors of North America. The job shouldn't be too demanding, since Fiat pulled out of the North American market earlier this year. A spokesman says they're still selling Ferraris here,and must provide Fiat parts and service for 7 years. ■ Chevy's **claiming number one** status in 1983 model year trucks. The division sold 917,240 trucks through the end of September, a 20.9% increase over last year.

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STRATEGY '84

Chrysler's Iacocca: "I don't think you can plan for the up-cycle. You're better off planning for the down-cycle to keep from going bankrupt."

American Motors' Tippett: "Longer range we obviously have to get ourselves competitive with the Japanese. We can't ask the American people to put up with protectionism forever."

General Motors' Smith: "We could build the best cars in the world, but a lot of our success will still depend on what happens in Washington."

Ford's Caldwell: "I hope we can get the message across to the American people that you do not have to buy a foreign product to get high quality or fuel economy or good value."

Volkswagen's Phillips: "We can afford to go a little bit more on the attack than the defensive situation we had to run a year ago."

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Iacocca sees an excellent market for his company in the next 12 to 18 months, but he also plans to take on GM, the Reagan administration and the Japanese!

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Now that domestic automakers have improved the quality of their cars, the trick is how to sell that fact.

51 AMC: Tippett Striving For Profitability
AMC's sales are up, but expensive product reorganizations have cost the company plenty. Chairman Paul Tippett says profitability is just around the corner.

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"Here I am," says car No. 799 to the welding robot. "Spot weld me the way I tell you to!" A Philips-developed remote identification system has tremendous potential.

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Major industry analysts and research associations say the auto industry is picking up, inching toward (and maybe past) 10 million new car sales.

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The industry's top executives tell us their hopes and fears for the months ahead as Detroit slowly regains profitability.

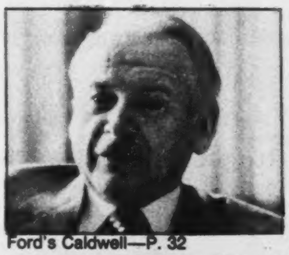
NEXT MONTH

A detailed look at GM's Project Saturn, plus a critical look at industry automation highlight our January issue.

QUOTABLE

"The biggest drawback to plastic is its name. Then again, our customers do not react negatively to plastic when it brings advantages. The new S-class has the highest proportion of plastic among large-scale production cars and is still fully accepted by our customers."—Werner Breitschwerdt, head of Daimler-Benz R&D, from an interview in the German science periodical *Bild der Wissenschaft*.

GM's Smith—P. 22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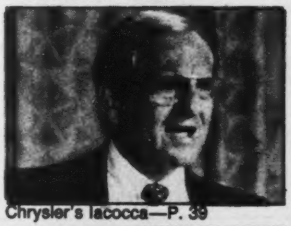
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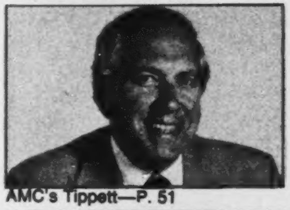
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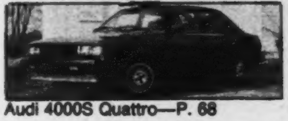
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V.A.T. Debacle

DOES AMERICA SUBSIDIZE ITS IMPORTS?

America's antiquated tax system may well encourage imports and discourage exports. Politically, any new tax is unwelcome. But most US automakers agree that something must be done to correct a serious imbalance in America.

by John McElroy

A strong dollar, high wage rates and low productivity are the scourge of the US auto industry. But even if these problems are overcome, the basic tax structure placed on the industry could prevent it from ever being totally competitive.

Moreover, this tax structure results in a potential tax loss to the US Treasury exceeding $2000 per imported car, according to my research.

Tax revenues represent over 30% of the Gross National Product (GNP). In other words, a typical product produced in the US carries over 30¢ of tax-related costs for every dollar of price when it is sold.

This includes state, federal and local taxes, as well as a host of other taxes such as the income and social security taxes paid by workers who make the product.

However, according to studies conducted by trade economists in the late 1970s, different sectors of the US economy are taxed at different rates. The tax rate on industrial goods is actually closer to 40-45%.

Therefore, the average American-built car, which now sells for over $9000, contributes $3600 in taxes to the economy.

An imported car sold in the US contributes far fewer taxes since it is built overseas. To determine what it *does* contribute to the US economy it is necessary to determine how much value is added to the import in the US.

This can be done by subtracting the port of entry (POE) price paid by the importer from the actual selling price, since the difference represents value added in America. By taking 30% of the American value added, the import car's contribution to the US economy can be determined. (The 30% tax rate can be used here because imports are not subject to the higher tax rate imposed on industrial goods.)

The average imported car in the US sells for more than $9000, and its POE value is about $6500, according to the US Dept. of Commerce. This means the American value added for the average import is $2500. Therefore, it's contribution in taxes to the US economy is $750 ($2500 times 30%).

US Treasury Loses $2850 Per Import

Origin Of Auto	America	Overseas
List Price In America	$9000	$9000
American Value	$9000	$2500
Applicable Tax Rate	40%	30%
Amount Of Taxes Paid	$3600	$ 750
Difference In Amount Paid	$2850	
'82 Import Sales	2.2 million	
Total Tax Loss From Imports	$6.3 billion	

The difference in tax contributions of a US-built car versus an import is $2850 ($3600 minus $750).

About 2.2 million imports were sold in the US in 1982, implying there was a possible tax revenue loss of $6.3 billion (2.2 million cars times $2850). Of course this assumes that consumers who bought imported cars would have bought American cars instead. This figure, in and of itself, is intriguing, but is only part of the story.

Most international trade economists would say that this tax loss from imported cars is balanced by taxes generated from US exports to other countries.

But this reasoning doesn't hold true with Japan, for instance, since the Japanese commodities we import and the US commodities they import are very different. The US suffers a $20 billion trade deficit with Japan, of which about $13 billion is automotive-related. Sixty percent of US exports to Japan are agricultural commodities and raw goods.

The same trade economists' studies indicate that the tax rate on US agricultural goods is around 20-25%, as opposed to the 40-45% tax on industrial goods. So if the US imports a car worth $9000 instead of selling an American car worth $9000, it ends up with a tax loss of $2850. (Chrysler puts the figure at $1750). And if it tries to make this up by exporting $9000 worth of agricultural goods, there is still a net loss because of the different tax rates.

At the very least, it can be said that the US is hampering its exports of industrial goods by burdening them with a disproportionately higher amount of taxes.

When the total trade picture is taken into consideration, it is obviously fair that the country in which a car is produced should benefit the most from the taxes which that production generates.

However, the major industrial nations in the world, except the US, allow a certain portion of indirect taxes to be rebated from their cars when they are exported. To be more specific, a country may exempt exports from commodity or value added taxes (VAT) on the grounds that such taxes should be levied where goods are sold (location of consumption). At the same time, those countries can impose commodity and VAT taxes on imports on the same principle—that goods should be taxed where they are sold. This is completely legal under the General Agreement on Tariffs and Trade (GATT) as signed by most industrialized countries (including the US and Japan) in 1947.

As an example, in Japan, on average, a 20% commodity tax is applied not only to cars built and sold in Japan, but also on automobiles that Japan imports. That is to say, if a car in Japan with a sticker price of $9000 is slated for export, the commodity tax rebate reduces its price by $1800 to $7200.

Furthermore, a $9000 US-built car sold in Japan is hit with a 20% commodity tax, raising it price to $10,800. This makes the US model un-competitive both at home and abroad.

As we go to press, a bill introduced in

(Continued)

V.A.T. Debacle

Typical VATs On Cars In Europe

Country	Value Added Tax On Cars
Ireland	35.0%
Sweden	23.5%
Denmark	22.0%
Belgium	19.0%
France	18.6%
Italy	18.0%
Netherlands	18.0%
Austria	18.0%
England	15.0%
W. Germany	14.0%
Luxembourg	10.0%

These taxes do not apply to exported cars. In many countries cars are subject to additional sales and other taxes.

the US Senate by Sen. Carl Levin (D-MI) would counter the commodity tax on imported cars. The bill only applies to those nations which have over 10% of the US car market, i.e. Japan. A US tax would be imposed on such imported cars equal to the cost increases borne by domestic autos when entering foreign markets. In effect, it is a reciprocity bill.

As noted before, it is not unfair if an imported car doesn't generate as many taxes in the US as a domestic auto, because it was built in another country. But commodity and VAT taxes are defacto subsidies. They stimulate sales overseas, which in turn increase profits and jobs at home, thereby erasing the lost revenue from rebated taxes. Unless it can figure out a way of equalizing commodity or VAT taxes, the US will actually subsidize the sale of every car it imports. ■

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How Foreign VATs Hurt Us

Origin Of Auto	America	Japan
Commodity Tax In Home Country	—	20%
List Price In Home Country	$9000	$9000
Tax Deleted At Export	—	$1800
Tax Added At Import	$1800	—
List Price In Foreign Market	$10,800	$7200
Difference	$3600	

Most Industry Execs And Economists Favor V.A.T.

Lower-priced Japanese products are seriously attacking more than 50 different industries in this country, including the automobile, machine tool, farm implement, computer and electronic markets.

Naturally, this has produced many problems for us, including a foreign trade deficit that may reach $70 billion this year and billions of dollars in lost tax revenues.

Many top executives have concluded that the Japanese commodity tax is one of the biggest contributors to their success in the American auto market.

Trade officials, especially those in Japan, often deny that this tax is a subsidy to encourage exports. However, a V.A.T. acts exactly like an export subsidy becauses it's cancelled on any product that's exported.

Robert E. Lighthizer, the deputy US trade representative, recently told *AI* that the Reagan administration is opposed to value added taxes, even though all our "trading partners" use them. However, he also revealed that the administration probably hasn't even studied this major trade device.

"The question really is, do you want to have a national sales tax in this country," Lighthizer says. "My sense is that most Americans do not. There are state sales taxes already. The federal government shouldn't pre-empt them and have a federal tax like that.

"I should say I'm really speaking on my own behalf, because the administration hasn't really studied it. At least I'm not aware that they've studied it."

A recent *Business Week* article claims that Martin S. Feldstein, chairman of the President's Council of Economic Advisors, prepared a speech early this year in which he promoted a "consumption tax" or value added tax. Such a tax, he argued, would discourage spending while encouraging savings, and this would probably lead to investments that provide more jobs.

The speech was never delivered. The White House changed signals at the last minute. *Business Week* says this incident illustrates both the intellectual attractiveness and the political difficulties of implementing a value added tax. V.A.T.s have attracted economists since they were first espoused in 1651.

It's important to understand that this tax would not be applied to food, housing and other essentials. In addition, income taxes and other taxes would be dramatically reduced.

The serious problem which Japanese value added taxes create for the US auto industry has been hammered at repeatedly by Chrysler chairman Lee Iacocca, Ford chairman Philip Caldwell and AMC chairman Paul Tippett. Only GM is uncritical of this Japanese tax. That is undoubtedly because GM may become the country's largest importer of Japanese cars. The company will import billions of dollars worth of Japanese Isuzus, Suzukis and Toyota parts in the next few years.

Robert Lutz, Ford's VP of International Operations, is adamant about V.A.T.s. "There's a total unfairness in the fact that Japan and everybody else operates on a value added tax system. Since the US doesn't have such a tax, the Japanese vehicles come in without a tax load, whereas our cars have taxes scattered all through them, which we pay on every car. The US has to address that problem. Otherwise, they're [the Japanese] going to clean out our industry."

Others who have recently spoken out in favor of a V.A.T. are John E. Chapoton, assistant Treasury Secretary for tax policy, and Alan Greenspan, former chairman of the Council of Economic Advisors.

A few years ago the chairman of the US House Committee on Taxation also advocated this kind of tax. However, this seriously disturbed his constituents, and he was badly defeated in the next election. ■

—Joseph M. Callahan

MARKETING/ ANALYSIS

QUALITY:
THE NEW YARDSTICK

Now that domestic automakers have improved the quality of their cars, the trick is how to sell that fact. Differing public perceptions of quality, however, stand in the way of Detroit's new tool for one-upmanship.

GM chairman Roger Smith examines a set of statistical control charts at Cadillac's Livonia Engine Plant while a supervisor explains their effect on quality.

by John McElroy

The domestic car companies have found a new yardstick with which to compare their cars to the competition's.

Traditionally, marketing and advertising programs have centered on comparative pricing or rebates and financing. Today it's quality. And when it comes to proving supremacy, the claims are quite pointed; even nasty.

Recently, Ford unleashed a barrage of corporate advertisements which claimed its cars have 10% better quality than GM's and a whopping 36% better than Chrysler's. As you might expect, GM and Chrysler don't exactly agree. (As we go to press, the FTC has ordered Ford to document the quality claims made in its commercials and ads.)

The word in Detroit is that Chrysler threatened to pull its advertising from the networks than ran Ford's ads. When that didn't work, Chrysler hit back with its own TV and print ads questioning the validity of Ford's research. These ads center on safety recalls during the last two years, and suggest that Chrysler's quality is four times better than Ford's.

General Motors hasn't named names, but has responded with print ads which claim that the ultimate test of quality is in how many people actually buy the product. And since GM sells more cars, the implication is that GM has the best quality.

Obviously there are different ways of measuring quality. But what exactly is quality? To different people it means different things.

"Overall, quality is a constantly changing perception by the consumer," says J. D. Power of J. D. Power & Associates. "You can't measure quality in a laboratory. It's the total experience of the consumer that counts."

Power & Associates publishes a Consumer Satisfaction Index once a year that is based on interviews with owners who have had their cars a year—a critical time since most warranties have just run out.

The most important finding of the 1983 survey, according to Power, is that the overall index is up 9.5% from the previous

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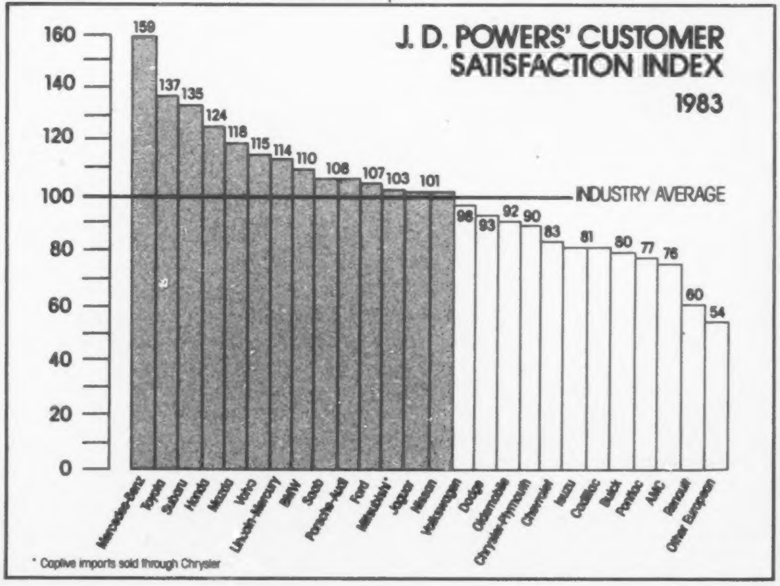


J.D. Powers' Customer Satisfaction Index shows that Lincoln-Mercury and Ford cars have dramatically improved their quality.

Coordinating Colors With Stat Control

Attitudes about color are pretty subjective—one person's blue is another's aqua. But when it comes to coordinating the colors of different car components, subjectivity has to be kept to a minimum.

"Colored components of the automobile are often manufactured in different plants," explains Dr. Lonnie C. Vance, a statistician in the Mathematics Dept. of GM Research Labs (GMR) in Warren, MI. "But when, for example, the glovebox door and ashtray are brought together in the instrument panel, their colors have to match.

"To ensure this, GM's Fisher Body has relied solely on highly trained observers who look at the components under special lighting and reject those not up to standard. The method has worked well, but Fisher Body wanted to make the process more automatic and less subjective."

So, GMR developed a technique that uses instrument measurements and statistical methods to make color matching more objective.

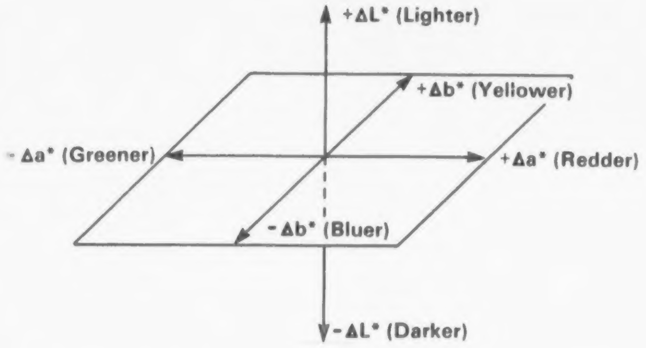
First, it established an acceptable/unacceptable standard for each color based on input from Fisher Body's observers. Then, to get a numerical reading, it measured reflected light with an abridged spectrophotometer and a colorimeter. After that, it was merely a matter of measuring a sample color with those instruments to see how near or far it was from the standard.

To ensure that the instrument readings correlated with the visual judgements, Vance used a statistical technique that classified the data of the samples on a graph. As it turned out, the samples that were measured by the instruments were in close agreement with the samples found acceptable visually.

This technique is now being used on a trial basis in several GM plants to standardize visual judgements of the color of incoming material. "I should add," says Vance, "that the system is intended to supplement visual inspection; not replace it." ■

—*John McElroy*

FIGURE 1
COLOR DIFFERENCES IN THE 1976 CIE L* a* b* (CIELAB) COLOR SYSTEM



GM Research Labs developed this graph to statistically aid Fisher Body inspectors in standardizing visual judgements of the color of incoming material.

year. This, he says, is an indication that the manufacturers as a whole are more concerned with quality.

GM recently concluded a study to determine how the public measures quality. It was conducted in several phases by General Motors Resarch (GMR) which even hired outside clinical psychologists so that the study wouldn't reflect a GM bias.

Based on thousands of questionnaires and interviews with special focus groups, the study categorized new car buyers into four distinct groups with different definitions of quality. One advantage of this study is that GM can focus its advertising and marketing programs at these groups to appeal to their concerns and desires for quality.

Although few details of this study have been made public, two fascinating tidbits have come to light. The overriding quality concern of those interviewed was that they don't want their car to stall in an unsafe area, whether that's a busy intersection or a dark alley.

Second, one of the groups, which GM believes may represent as much as 15% of the car buying public, says that safety equals quality. If true, this shows that the automakers have been missing a significant opportunity. Contrast this, for example, to the advertising effort aimed at the performance market, which also represents about 15% of the total market.

Perhaps the most important aspect of this whole quality question, however, is how the domestic automakers were able to improve their quality. Just a few years ago they wouldn't have dared to use quality as a competitive yardstick.

The Japanese and European automakers had such superior quality that most executives in Detroit would just as soon never bring up the topic. Yet, the Power survey shows that Ford, for one, has been able to pull past a number of imports, although imports admittedly still dominate the top of the list. And as the Power survey also shows, the imports' quality level is a moving target.

Nonetheless, it would seem that the industry's recent emphasis on qualty circles among its hourly employees, the increasing use of statistical quality control and better efforts at improving dealer service is beginning to pay off. Perhaps even more important is the attention that top management is personally devoting to quality.

In the long run, the new emphasis on quality could result in higher productivity, better labor relations and more satisfied customers. But for the time being, it would appear that quality is going to be an aggressive marketing yardstick. ■

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INDUSTRY ANALYSTS:

WELCOME TO EASIER TIMES

AI contacted the major industry analysts and research associations to get a concensus on the direction of the US auto industry. Their answer: the industry is picking up, inching toward (and maybe past) 10 million new car sales and more than 3 million light truck sales, although storm clouds may be ahead.

by Andrew M. Andrews

There's a war being fought, as the economy brightens, to reach today's car buyer with a package that gives him what he wants. Analysts are having a field day predicting what's in store for a more healthy industry.

But clouds of uncertainty hang over the automakers. Will import restraints continue, and if so, at what rate? How big is the performance car market? How big is the mini-van market? Will buyers continue to go "up-market"? How will CAFE (Corporate Average Fuel Economy) standards be met if consumers insist on buying larger, less fuel efficient cars?

Restraints Are Key

At press time, negotiations continue over the Japanese voluntary import restraints. It seems certain that some form of restraint will continue, but the exact level of the restraints is uncertain. Yet some analysts see continued restraints, in any form, as bad for the consumer, and eventually, for the industry.

"The expected extension of voluntary Japanese import restraints will ultimately lead to higher passenger car prices, thereby curtailing sales somewhat," says Wesley Stuchlak, manager, North America market analysis for Chase Econometrics.

Other analysts disagree. "The Japanese have been pretty good at holding the price umbrella up," explains Ann C. Knight of Paine Webber.

"The Japanese are highly restrained," says Stuchlak. "But sales rates in general are going up. The Japanese will have a slightly higher quota after March 1984, but sales rates for the industry will be so much higher that they [Japanese cars] will be in extremely short supply.

"They will have no choice but to bring in higher priced cars, raise the prices on

Analysts See Steady-State Growth In Sales (in millions)

	Merrill Lynch	Chase Econometrics	Research Bernstein	Data Resources	Automotive Information Council	Predicasts, Inc.	Prescott Ball & Turbin	Paine Webber	AP Parts
PASSENGER CARS									
1984 US Production	7.5	7.5	7.8	—	7.5	10.5	7.5	10.35	7.35
1984 Sales, US & Imports	10.3	10.4	10.3	10.6	10.0	7.45	10.3	10.5	10.1
LIGHT TRUCKS									
1984 US Production	2.5	2.6	2.8	—	2.4	—	2.6	2.9	2.42
1984 Sales, US & Imports	3.1	3.2	3.2	3.4	2.7	—	3.1	3.4	3.1

Source: AI Marketdata

everything, put in higher levels of equipment—anything they can do to capitalize on the fact that they've got a very hot product and [consumers] can't get enough of it."

In recent years, Stuchlak says, the Japanese have shipped more up-scale or sportier cars to the US. But the Japanese will not abandon any particular marketplace, he says. "On the contrary, they want to maintain a presence in as many market segments as they can."

Two Automakers Lag

While GM turns in its best third quarter ever, Chrysler rebounds nicely and Ford hangs tough, the financial atmosphere in Detroit appears rosey...except for VWoA and AMC. Analysts explain that these two car companies can be held responsible for bad sales because of bad pricing and cheaper, identical offerings from competitors.

"AMC has spent a lot of money for tooling costs, and they've had to amortize some of that debt," Stuchlak says. It will be "maybe 1984 before they'll show a profit."

VWoA is starting to recover from the virtual death of diesel sales, yet Stuchlak claims the company's future prospects still aren't that great.

"Looking at the 1985 Rabbit, it doesn't look to be that much of an improvement over the existing Rabbit," he says.

CAFE Under Gun

In 1984, CAFE standards will be under the gun from GM and Ford, which are fast using up accumulated credits. If the American penchant for relatively big cars continues, something has to give.

Motor Vehicle Mfgs Assoc.	Citicorp Information Services	Arthur D. Little	AVERAGE
—	—	10.2	8.47
10.3	10.5	7.6	9.86
—	—	3.1	2.67
3.38	—	2.3	3.09

"The question is whether we'll just eliminate the penalties," Stuchlak says. "Somehow they'll be eliminated. They're talking big dollar amounts for Ford and General Motors.

"On the other hand, that's going to tick off Chrysler because *they've* met CAFE and have downsized almost all their cars."

Yet Paine Webber's Knight says there are ways to get around CAFE. "There are lots of loopholes under the enabling legislation," says Knight. "And why shouldn't GM and Ford try to wiggle their way through some of the loopholes?"

Knight says the battle will continue, with the manufacturers trying to find loopholes and the "EPA types" trying to close up the loopholes.

"The EPA has taken on a kind of political life of its own," she says. "And I don't think a presidential election is going to change it much, one way or the other."

Chase Econometrics says the increased demand for more luxury and sports cars is tied intimately to the stability of gasoline prices. This trend should continue.

"Gasoline price increases will be slower than the overall rate of inflation," Stuchlak says. "So with declines in the real price of gasoline, conventional wisdom has it that people would want to buy larger cars. That's fine, except that GM, Ford and Chrysler are all limited in their large-car capacity right now.

"In the wake of the gasoline price and availability problem, some people are switching back to larger cars," Stuchlak continues. "In our current forecast, we expect that gasoline prices will edge down in 1984 and possibly in 1985, depending on how much demand for gasoline products remains depressed."

Lower-Income Buyers Attracted

According to Peggy Pentecost of the Automotive Information Council, "AIC believes consumers are ready to buy new cars." She says an industry survey made earlier this year asked consumers whether they believed the next 12 months would be a good time to buy a car. Two-thirds of the families surveyed "held favorable car-buying attitudes."

As the economy continues to recover, the forecast looks good for sales to lower and lower/middle income groups. They were hit hard during the recent recession, and many analysts agree that the recovery won't reach full stride until automakers give them what they want.

"We don't expect people to become as insensitive to price in this recovery as they had been in the '60s," says Knight. She says overall "utilities," such as size of car, performance and price, determine what many families buy today.

But the perception of the "typical car buyer" is changing, according to Stuchlak. Demographics favor a strong luxury car market. The US now includes more affluent families. "People from the baby boom generation are entering their peak earning years now," he says.

Light Truck Competition Hot

New car and light truck sales "will continue on an upward swing stimulated by manufacturing promotions and innovative financing—interest rates in the 12-13% range," according to Karl Motter of AP Parts. "As consumer confidence builds and confidence in the economic recovery solidifies, consumers will project this momentum in their purchases of new cars and trucks. Assisting new truck sales will be the new downsized versions of vans and the like."

Chase's Stuchlak says the light truck market should remain "very price competitive, however, due to the large number of competitive products and excess production capacity, especially in the pickup segment."

Diesel Sales Dismal

The one automotive segment that continues in the doldrums is the diesel car market. Diesels will not sell, say the analysts, because the gasoline engine has made such huge strides in fuel efficiency.

A prime example is Honda's Civic CRX Coupe which is EPA rated at 51 mpg (4.6 L/100 km). That figure easily tops VW's Rabbit diesel, rated at 47 mpg (5.0 L/100 km) and the perennial fuel economy champ.

Fuel prices also offer disincentives for buying a diesel. "Diesel fuel is priced just about on top of gasoline," Stuchlak says. "There's not the big differential there used to be."

According to Knight, most consumers view diesels as "more expensive and unreliable, and the fuel is more expensive than gasoline."

She is very concise in her explanation of the diesel's lack of popularity: "The reason they're disappearing is that nobody wants them. They've been surpassed in technology by other engines." ■

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CHILTON'S 1/1984

AUTOMOTIVE INDUSTRIES

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GM's High Tech Salvo In The Small Car War

Are We Overdosing On Automation?

How To Glue A Car Together

Including **Truck & Off-Highway Industries**

AUTOMOTIVE INDUSTRIES

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GM shoots for the moon, or even beyond, with advanced manufacturing techniques and a import-fighter for the late '80s. Is it real, or just science fiction?

NEXT MONTH

Our Man of the Year issue also details goings-on at the SAE Expo, and the manufacturing techniques Harley-Davidson is using to become more competitive.

QUOTABLE

"Honda is playing to a different drummer than all the other motorcycle and car manufacturers in that they're very committed to manufacturing in the countries in which they do business. I believe the [Marysville, OH] motorcycle plant was really a pilot operation for their automobile plant. I believe the engine plant that they have just announced for motorcycles is a pilot plant for automotive engines."—Vaughn Beals, CEO of Harley-Davidson Motor Co., speaking at a press conference at the company's York, PA assembly plant.

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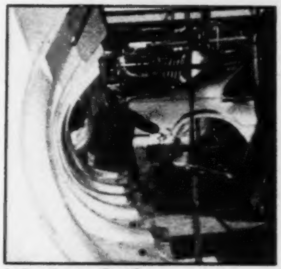

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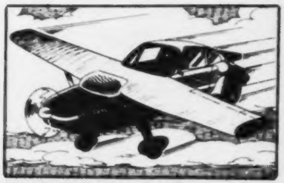

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AI MARKETDATA

GM Productivity Shows Recent Jump

General Motors' productivity rate, which remained fairly constant from 1973-1978, suddenly jumped 21% between 1980-81 and second quarter '83, according to a report by Goldman Sachs Research. The firm tabulated total manhours from GM's average number of US hourly employees, total US payroll and average hourly earnings (excluding benefits). When these figures were tallied in with car and truck production, units per thousand manhours were calculated. While the figures generated are higher than usual for manhours per car, the methodology remains constant from year to year and the findings in regard to productivity are therefore valid. Goldman Sachs says manhours per unit were 173 in 1969; in second quarter '83 they were 136, hence the 21% improvement. The firm says this improvement didn't come gradually over the years but occurred mostly during this decade.

The report also points to the "staggering cash flow coming out of GM." By 1985, the firm predicts cash flow could exceed $40 per share, with capital spending in the $22 per share area. This would leave $18 per share in excess cash flow, or $5.7 billion. In 1978, GM's last peak year, excess cash flow amounted to only $1.9 billion.

US Retail Sales, 1982-1984
(thousand units)

	1982		1983		1984	
	units	% of total	units	% of total	units	% of total
General Motors	3515	44.3%	4095	44.7%	4709	45.5%
Ford	1346	16.9%	1608	17.6%	1869	18.0%
Chrysler	692	8.7%	870	9.5%	1035	10.0%
American Motors	112	1.4%	191	2.1%	217	2.1%
VWoA	91	1.1%	86	0.9%	101	0.9%
Total domestic	5757	72.2%	6850	74.9%	7925	76.6%
Imports	2222	27.8%	2300	25.1%	2425	23.4%
Total	7979	100.0%	9150	100.0%	10350	100.0%

Source: Goldman Sachs Research

DRI Eyes World Market

The largest and most mature car markets continue to fuel the uneven world automotive recovery, with the US leading the way, according to DRI Europe Ltd. While the fastest rates of growth center in the Asia/Pacific and Middle Eastern markets, these areas start from a very low base. Once highly regarded for its medium term potential, Latin America will "mark time until late in the decade" because of its current debt dilemma, says DRI. Western European demand remained incredibly stable throughout the recession, and so the Continent will witness the slowest new sales growth as the world market rebounds, according to the report

The car production share currently held by North America and Western Europe will decline as Asia/Pacific and Latin America emerge as net exporters late in the decade. Even Japanese producers will be obliged to look to the export of knock-down sets for assembly in the consuming country rather than exporting complete cars to achieve future growth.

	New Car Sales (in millions)			Car Production (in millions)		
	1983	1984	1988	1983	1984	1988
West Germany	2.42	2.47	2.62	3.86	3.94	4.23
France	1.99	1.90	2.11	2.84	2.82	2.83
United Kingdom	1.77	1.66	1.70	1.05	1.02	0.96
Italy	1.59	1.67	1.73	1.44	1.48	1.62
Total Western Europe	10.40	10.44	11.26	11.06	11.15	11.63
United States	9.27	10.45	11.76	NA	NA	NA
North America	NA	NA	NA	7.82	8.92	9.31
Japan	3.16	3.26	3.50	7.15	7.46	8.16
Total World	29.54	31.27	35.23	NA	NA	NA

NA—not available

Source: DRI, Nov. '83

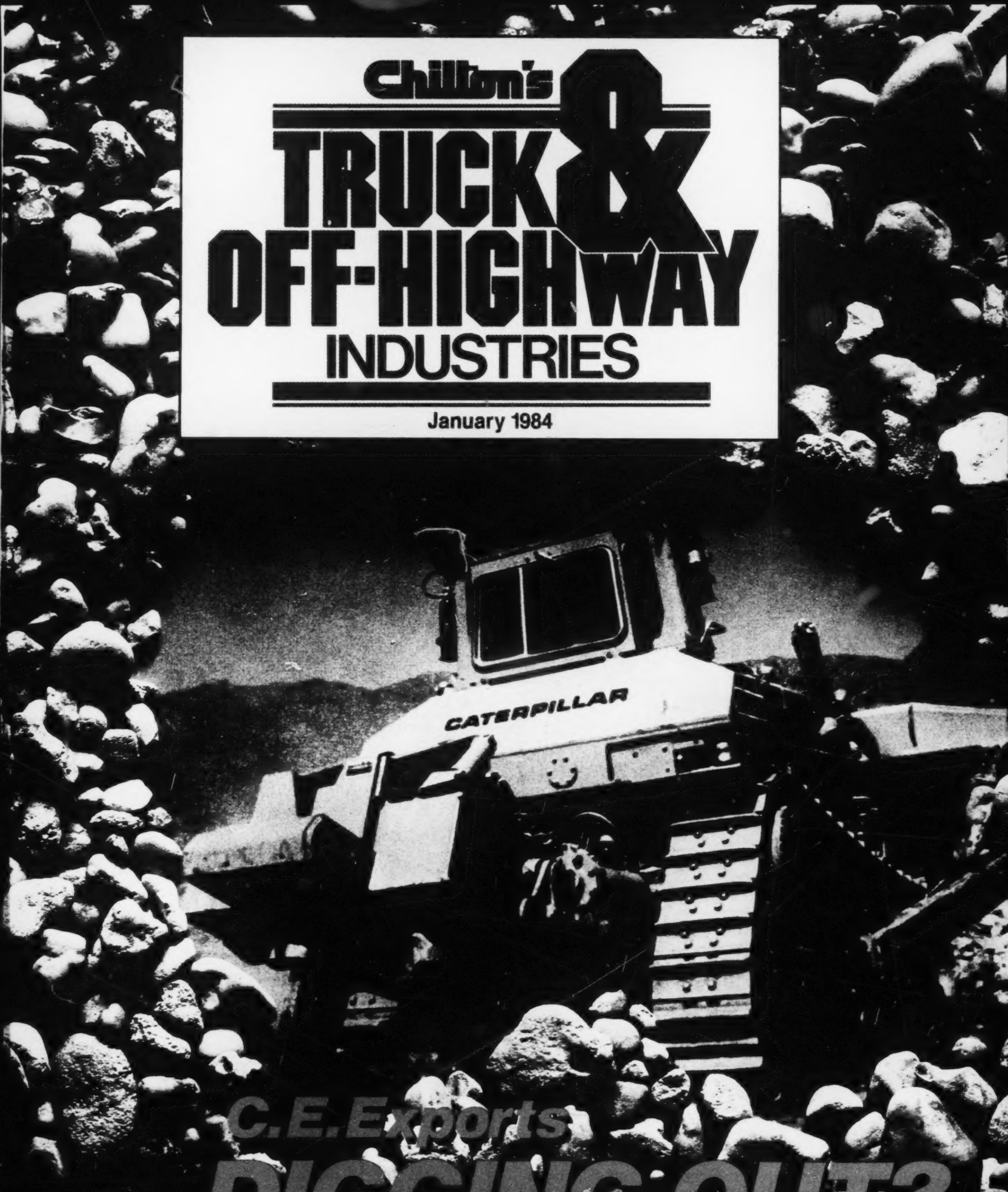
B-W/Clark Clutch Joint Venture

Borg Warner Corp. and Clark Equipment Co. are seriously considering setting up a joint venture to build and market manual transmissions and clutches. The venture should be formalized by the end of the first quarter, according to a B-W spokesman. As to the types of trannies to be included, the spokesman says it's still up in the air because "we don't know yet what's going to fall out of this thing." Borg-Warner builds automotive transmissions while Clark's known for its medium-duty truck transmissions, and off-highway powershift transmissions and axles. The joint venture would include facilities of both companies in the US, Mexico and Brazil.

Chilton's

TRUCK & OFF-HIGHWAY INDUSTRIES

January 1984


CATERPILLAR

C.E. Exports DIGGING OUT?

HD Diesel Pistons : Ceramic Squeeze Play

Chilton's
January, 1984 Volume 5 Number 1

TRUCK & OFF-HIGHWAY INDUSTRIES

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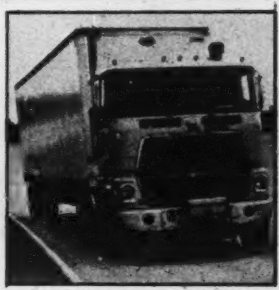
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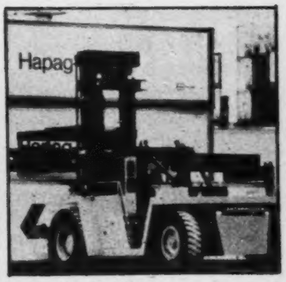

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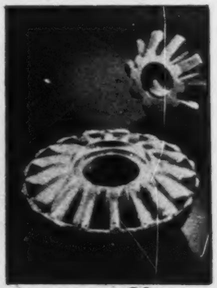
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HD manufacturers continue to dig for export markets while fighting imports at home.

NEXT ISSUE

TOHI ***charts the trends in the American heavy truck industry.***

C.E. EXPORTS

DIGGING OUT?

1981 was the last year of 'great exportations' for US construction equipment manufacturers. The subsequent downturn and massive shakeout has redefined the gobal market for US exports away from red-hot expansion and toward cool-headed efficiency.

J.I.Case, the third largest manufacturer of construction equipment worldwide, has streamlined product and stands poised to respond to the changing export market quickly.

By Lance A. Ealey
and Douglas Williams

Will 1981 remain the all-time levee-buster in terms of construction equipment export sales? That year, 132,865 pieces of construction equipment and related components were exported, worth $6.3 billion. What followed is an oft recited litany of devastation worthy of Edgar Allen Poe.

In recession-plagued 1982, exports plunged 37% to 106,006 pieces worth $3.97 billion, and first half 1983 returns, 50% below the figures attained in 1982, are rebounding with the resilience of a dropped anvil. ("For the first time in history, all of our markets were down simultaneously," says a Caterpillar spokesman.)

Unlike the American automotive industry, exports are big business for most US construction equipment companies. "Traditionally, they've represented half our volume of business," says Cat's spokesman.

Some of the current export tumble results from the recent worldwide recession, he explains, adding, "Exports of construction equipment aren't going to mount rapidly when countries formerly carrying out long term planned national development programs have substantially curtailed them."

And subtly profound changes are taking place in this vital segment. "In past recoveries, heavy goods, durables, machinery, have been a major part of the recovery," he continues. "As our chairman noted not long ago, that hasn't been so evident this time. Some of it can be attributed to the strong dollar, but a lot of it has to do with the fact that other economies around the world now have the strength and capabilities to provide goods and services that we formerly exported. The US no longer has an exclusive on goods and services that used to be sold abroad."

"There are more manufacturers in more countries," agrees Frank Merrill, VP of International Operations for Barber-Greene. "And the current exchange rate isn't that terrific for us, either."

Cliff Young, an analyst for Arthur D. Little Inc., says another possibility for the current slump is "the US government restrictions on the pipeline equipment for the USSR. A lot of construction equipment manufacturers were anticipating to get a fair amount of overseas shipments for that work."

As for the plight of American CE companies today, Young states, "It's more a question of how important are the *imports* of construction equipment into the US. US manufacturers should be aiming at the domestic market for survival and prosperity. Imports [are] eroding the market share of the US producers. If you're not competitive in your domestic market, then how can you hope, with the strong dollar, to be effective in export markets against the same competition?"

The telling point of this argument is that virtually every serious entrant in the heavy-duty game is deeply into the integration of manufacturing on a worldwide scale.

J I Case, Eaton, Deere...every manufacturer dedicated to success in the business is putting more and more offshore manufactured parts into traditional products from tractors to transmissions.

Caterpillar lift trucks will be made by Koreans "to Caterpillar design and quality." Consolidated Diesel and Onan manufacture small and medium diesels in the US, but use parts made in Europe and the Far East.

And, as Young points out, US CE companies haven't exactly been dragging their feet in terms of manufacturing prowess. "It's ironic, but if you look at the introduction of new manufacturing technologies, things like flexible manufacturing systems, the introduction of group technology principles and other automation methods close to the state of the art, it seems the farm and construction equipment people in the US have been up at the forefront," he says.

"You see the same names all the time—Caterpillar, Harvester, John Deere—they've been investing very heavily under the adverse conditions we've been feeling, and they've really been at the forefront of introducing new technology."

The manufacturers say that survival in the tough global market demands dedication to becoming "the low cost producer." It was barely 5 years ago that the phrase started to become widespread. Back then, you heard more talk about market share. Today in the export market, "Your share of nothing is nothing," gibes Barber-Greene's Merrill.

A popular Cat export machine is the 973 track loader, introduced in 1982. Its rear 210-hp engine and hydrostatic drive allow a breakout force of 16,230 lb.

Cost Effectiveness Begins At Home

As Arthur Little's Cliff Young noted earlier, the struggle toward cost effectiveness in the world market begins at home. A good example of this is the recent dog and pony show put on by the world's biggest construction equipment company, Caterpillar. In the fall, the top executives at Cat traveled to San Francisco, Chicago and New York to meet with financial executives.

In a most unusual move, they then made essentially the same presentation in Caterpillar's hometown of Peoria to anyone interested. The talks were carried live on local television.

Robert E. Gilmore, president and chief operating officer, said, "Basically we're implementing programs that will place our 1986 cost levels more than 20% below those of 1981."

Four specific targets areas are: material costs; labor costs; in-process inventory; and the size and number of facilities Caterpillar operates, Gilmore said.

"In the average American company, process inventory is being worked on only around 5% of the time. We've traditionally been about twice that efficient, adding value about 10% of the time," Gilmore said.

"Even so, that means that 90% of our inventory is idle, waiting to be worked on, costing money the whole time," he

(Continued)

CIMA—-A Look At The Ecomony In Scale

Perhaps a better perspective can be gained on the CE export market by looking at the entire US economy. Dr. Roy Moor, senior VP and chief economist with the First National Bank of Chicago, told the annual meeting of the Construction Industry Manufacturers Assoc. (CIMA) recently something that most were at least vaguely aware of. "Beginning sometime in 1979 we have had a rationalization of the US economy" with the weaker companies being "merged, acquired and bankrupted." Divisions and assets have been sold off, the net result being increased price competition in every industry, Moor said, adding, "It's been a fundamental change in the US economy."

Everyone has heard the bad news, he said. But the good news is that "ours is the only economy in the world that has gotten more efficient; much much more efficient than in 1979," he told the CIMA executives.

Economist Moor makes firm projections on the US economy, hedged less than is common among market diviners. For example, he projects "through 1988 energy prices will stay right around where they are now." That's based on two assumptions. One is that there is no major outbreak of war in the Middle East such as an attack on Saudi Arabia or the closing of the Strait of Hormuz.

The second assumption, which is half prediction itself, is that the demand for energy worldwide will rise at a very, very slow rate. Then too, "it will be offset, particularly in the US, by increases in conservation," he said.

Given how fundamental energy and energy prices were in the economic disasters of the last decade, Moor's projections could be basic to whatever happens in the heavy-duty world for 1984 and beyond.

But as significant as energy is, inflation may be more important. And Moor's even more bullish about inflation (at least in the sense that the worst is behind us).

"Unlike 1980-81-82 when interest rates were declining rapidly, we have entered into a long term trading range" where interest rates probably will stick within a 3% range. "We are probably in the middle of that now. Interest rates are going to stay around these levels until 1989," he predicted.

As an adjunct to that, he sees the dollar weakening, but only slightly, through 1984. Then "it is likely to stay the rest of the decade where it ends 1984."

In terms of more specific predictions, he said, "Most major industrialized economies in the world will experience growth in 1984. In almost all cases, though, that will be less than what we in the US experienced in 1983."

When it comes to costs on a company-by-company level, his expectations are less bright.

"We can expect very few price increases between now and the end of the decade," Moor said. His reasoning follows the belief that purchasers have changed their attitudes towards price increases from what they were in the 1970s, when product was bought in spite of price increases because of the fear that prices would increase even further. "In the '80s, the consumer has decided that if there are any price increases, he'll cut back on his spending.

"There's also been a weeding out of weaker competitors in almost every industry, leaving only the stronger competitors which has increased competitive pressures, which in turn has resulted in much more acute price competition."

"All of us in this room learned our business lessons in the '60s and '70s, Moor told CIMA. "That was a distorted world and it was distorted by inflation."

Businesses grew in the '70s largely through leverage, borrowing and then paying back with cheaper dollars.

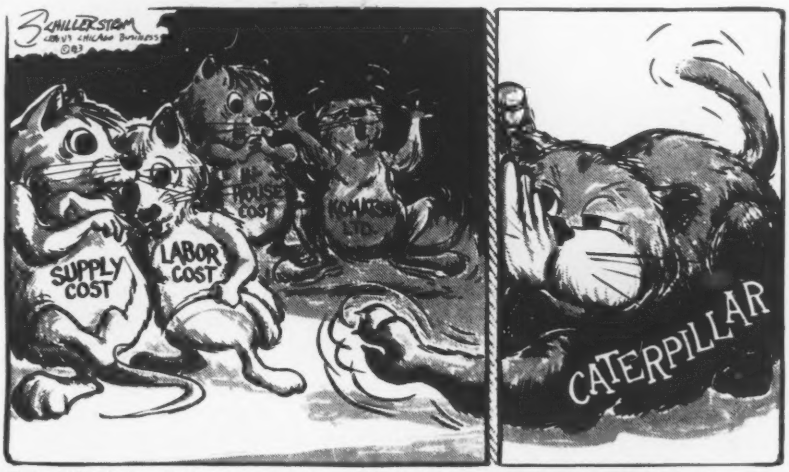
"Cost management, unlike the '70s, now becomes the name of the game," Moor said. ■

—L.A. Ealey and D. Williams

Construction Equipment Projections

	1979 Sales	1982 Sales	Prct. Change '83 to '82	Prct. Change '84 to '83
Crawler Tractors	19,500	7,050	+ 5%	+26%
export	6,900	3,100	−29%	+ 6%
Large Wheel Tractors	5,000	3,400	+ 6%	+25%
export	2,300	735	−55%	+22%
Crawler Loaders	6,300	1,400	+40%	+20%
export	1,100	500	−25%	+ 7%
4WD Loaders	21,600	7,600	+ 5%	+23%
export	3,900	2,100	−25%	+ 7%
Earth Scrapers	4,100	1,200	same	+20%
export	1,300	470	−50%	+ 6%
Graders	7,300	4,000	same	+25%
export	2,200	1,400	−28%	+13%
Hydraulic Excavators	5,700	1,800	+15%	+20%
export	1,200	320	−10%	+10%
Wheeled Hydraulic Cranes,	2,900	2,400	−50%	+20%
(Multi-station) *export*	360	360	−33%	+10%
Wheeled Hydraulic Cranes,	5,400	2,200	−55%	+20%
(single station) *export*	1,950	1,100	−40%	+13%
Lattice Boom Cranes	1,750	550	−40%	+25%
export	490	230	−30%	same
Average For All Groups	7,955	3,160	− 7%	+22%
export	2,170	1,032	−33%	+ 9%

Note: Exports are included in the larger total.
Source: 1979 and 1981 sales figures from Bureau of the Census. Anticipated changes for 1983 and 1984 as reported to CIMA by 39 manufacturers.



Caterpillar's hardball approach to world market competitiveness has kept the company healthy, despite irritations like the strong dollar and increased domestic market competition.

said. "Reducing that inventory saves material costs, expensive space and forces the company to use facilities and equipment more efficiently.

"Caterpillar's goal is to increase inventory turnover from four times a year to six times a year," Gilmore revealed. "All Caterpillar plants are forecasting turnover rates above five by 1984. When we reach our 1986 goal, and we will reach it, we will have achieved a permanent in-process inventory reduction of 37%."

Purchasing is another area Cat is tightening up. The East Peoria plant traditionally allowed suppliers 20 days leeway in delivery to be "on-time". That's now shortened to under 10 days.

Maintaining Export Share

One fortuitous result of the last 4 years is that the survivors in the world market stand poised to glean reapings from any uptick that market bears.

But maintaining export market share can be tough. "You're not talking about an individual market," notes Young, "you're talking about the composite of a whole series of world markets. In each of the export markets you have to set up the right sort of infrastructure to be able to address the needs of those markets in terms of sales support and service support, which can be very costly."

It's also true that the rules of the export sales game in some developing countries can be, well, unusual. "Their methods of conducting business also detract companies from wanting to get too heavily involved," says Young. "Having to buy contracts—it's not something you like to do, but it becomes part of the way of life in some Third World countries. If you want a share of that market when, hopefully, those developing countries become more mature in outlook, you have to show a presence now."

As for the future of CE exports, a Caterpillar spokesman says, "We've seen some encouraging signs, particularly in the US and other industrialized economies. However, in much of the world, including areas where we traditionally have sold many machines, economies continue to be down, so we continue to be cautious about the recovery."

Arthur Little's Young says the firm's projections call for around a 3½% compound annual growth rate for total construction equipment shipments from 1982 through 1992.

While gloom and doom generally prevail thoughout the CE export market, Young points to one possible bright spot on the horizon. "I think we can look forward to a loosening of the import restrictions that China has imposed so far. There's a feeling that by 1985-86, if the restrictions are lifted, there could be a doubling of the market in China. At the moment it's a tiny, tiny market, very small in proportion to total sales, but the potential for that market in the future is immense." ■

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CHILTON'S 4/1984

AUTOMOTIVE INDUSTRIES

NUMBER ONE IN THE INDUSTRY SINCE 1895

4/10/84
C2150-3

GM'S $2 BILLION GAMBLE

WILL TRADITIONAL 'BIG CAR' CUSTOMERS BUY DOWNSIZED C-CARS?

66TH ANNUAL SPECIFICATIONS SECTION

News/Analysis:
Has Long-Term Planning Hurt Short-Term Capacity?

AUTOMOTIVE INDUSTRIES

April, 1984/Volume 164, Number 4

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COVER

The king of the new C-cars, Cadillac's DeVille/Fleetwood range, may shock a lot of traditional, conservative consumers.

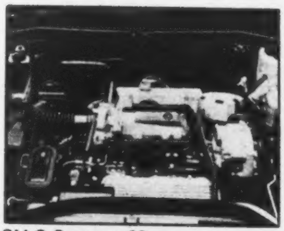
NEXT MONTH

An analysis of the storm clouds brewing between labor and Detroit, plus a look at steel's revitalization are yours in May.

QUOTABLE

"It's ridiculous to assume that 200,000 cars will ruin GM. One, it'll provide 12,000 jobs; two, we have an empty plant; three, we want to provide our dealers with something *now*."—GM chairman Roger Smith, referring to the GM/Toyota project.

"Black is like a woman in tight jeans—every defect shows. But we've got it down."—Pontiac general manager William Hoglund, apparently alluding to the division's progress in painting Fieros something other than red or white.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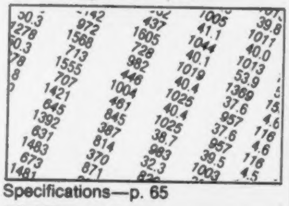
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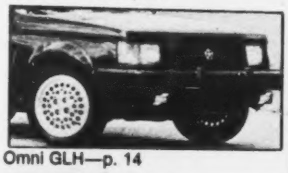
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ONE OF THE *ABC PUBLISHING* COMPANIES

ANALYSIS

AI'S TOTAL CAR COEFFICIENT

Wherein we multipy a car's interior volume by it's EPA city mpg and divide the result by it's 0-60 mph time and retail price. Proving once again that big, miserly, fast and cheap cars are very hard to come by.

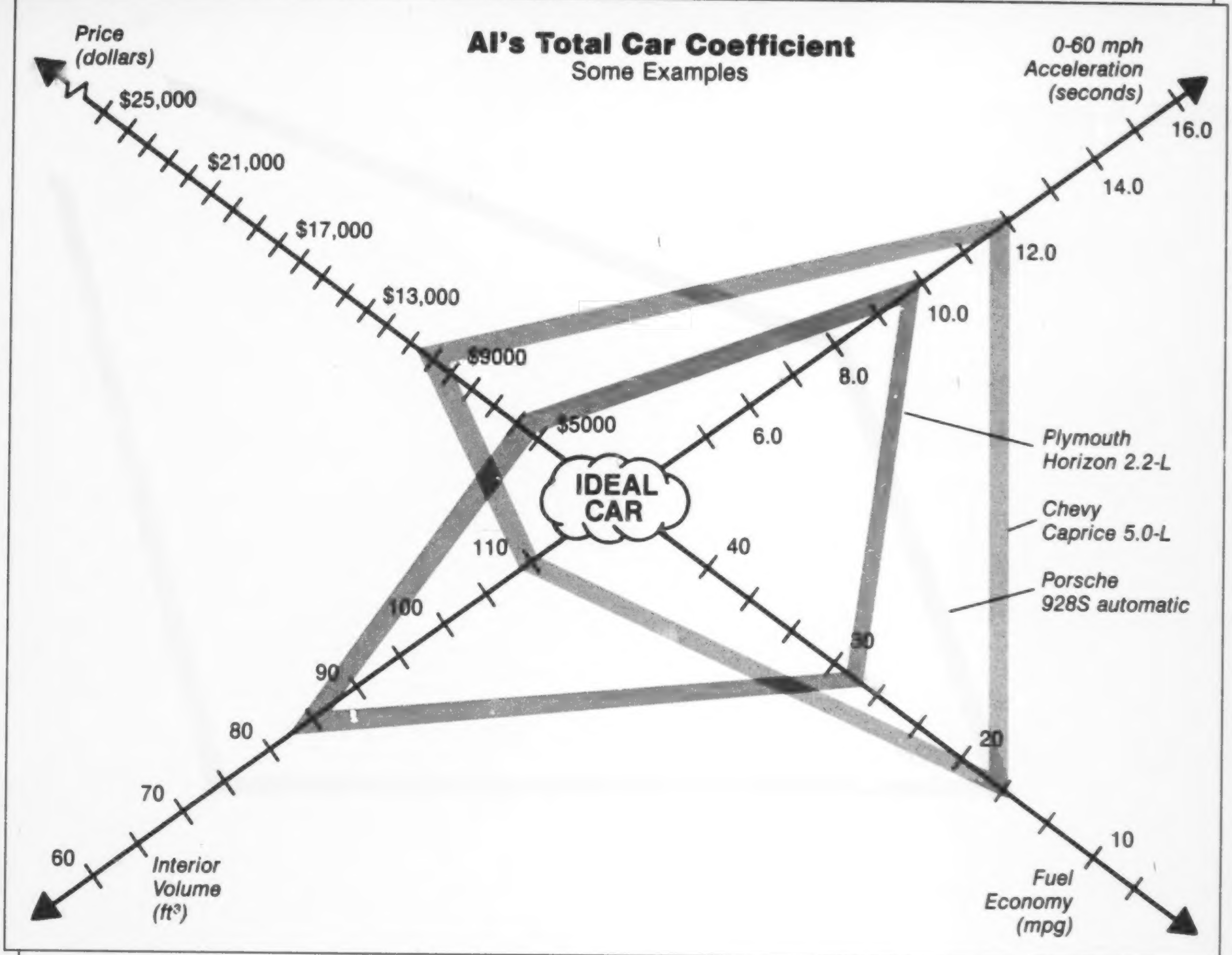
TCC	Under $8000
.41	**Plymouth Horizon, 2.2-L, 5-spd man.**
.38	Toyota Starlet, 4-spd man.
.37	Plymouth Horizon, 1.6-L, 4-spd man.
.33	Dodge Colt Turbo, 4x2-spd man.
.33	VW Rabbit L Diesel, 4-spd man.
.32	Dodge Omni GLH, 2.2-L, 5-spd man.
.31	Honda Civic S, 1.5-L, 5-spd man.
.29	Toyota Corolla LE, 1.6-L, 5-spd man.
.29	Toyota Tercel SR5, 5-spd man.
.27	Pontiac Phoenix, V6, 4-spd man.
.27	Chevy Cavalier Type 10, 5-spd man.
.27	Chevy Citation X-11, HO V6, 4-spd man.
.26	Renault Encore GS, 5-spd man.
.24	Ford Tempo GL, 5-spd man.
.23	Mercury Topaz LS, 5-spd man.
.22	Ford Escort GT, 5-spd man.
.19	**Pontiac 1000, 1.6-L, A/T**
.19	**Renault Alliance, A/T**
.29	**Group Average**

TCC	$12,000 to $18,000
.19	**Buick Regal Turbo T-Type, V6, A/T**
.16	Ford T-Bird Turbo Coupe, 5-spd man.
.16	Mercury Cougar XR7 Turbo, 5-spd man.
.15	Toyota Cressida, 5-spd man.
.14	Pontiac 6000 STE, HO V6, A/T
.14	Ford Mustang SVO, 5-spd man.
.13	Volvo Turbo GLT, A/T
.13	BMW 318i, 5-spd man.
.11	Saab 900 Turbo, 5-spd man.
.11	Audi 5000S, 5-spd man.
.10	Audi 4000S Quattro, 5-spd man.
.08	**Cadillac Sedan DeVille, 4.1-L, A/T**
.13	**Group Average**

TCC	$18,000 to $25,000
.09	**Volvo 760 GLE TD, 4-spd OD man.**
.08	Audi 5000S Turbo, A/T
.08	Mercedes 190E, 5-spd man.
.07	Porsche 944, 5-spd man.
.06	**Lincoln Mk VII LSC, 5.0-L, A/T**
.08	**Group Average**

TCC	$8000 to $12,000
.25	**Mitsubishi Tredia Turbo, 5-spd man.**
.24	Dodge Shelby Charger, 5-spd man.
.24	Pontiac 2000 SE Turbo, 4-spd man.
.23	VW Rabbit GTI
.23	VW Jetta GLI
.22	Dodge Colt Vista, 5-spd man.
.22	Toyota Camry, 2.0-L, A/T
.22	Nissan Stanza GL, 5-spd man.
.22	Honda Prelude, 5-spd man.
.21	Chevrolet Celebrity EuroSport, HO V6, A/T
.21	Toyota Celica GT-S, 5-spd man.
.21	Dodge 600 ES Turbo, 5-spd man.
.20	Buick Skyhawk T-Type, 1.8-L, 5-spd man.
.19	Dodge Daytona Turbo Z, 5-spd man.
.19	Mazda 626 TS, 5-spd man.
.19	Chrysler E-Class, 2.6-L, A/T
.18	Pontiac 6000 LE, 2.5-L, A/T
.18	Ford Mustang GT, 5.0-L, 5-spd man.
.17	Chevrolet Monte Carlo SS, HO 5.0-L, A/T
.17	Mercury Marquis, V6, A/T
.17	Ford LTD LX, 5.0-L, A/T
.17	Buick Skyhawk T-Type, 1.8-L, A/T
.17	VW Scirocco, 5-spd man.
.16	Olds Cutlass Ciera, 3.0-L, A/T
.16	Chevy Caprice Classic, 5.0-L, A/T
.15	Pontiac Firebird, 2.5-L, 4-spd man.
.15	Chevy Camaro Z-28, H0 5.0-L, 5-spd man.
.14	Chrysler Laser XE Turbo, A/T
.14	Oldsmobile Cutlass Supreme, 5.0-L, A/T
.14	Isuzu Impulse, 5-spd man.
.10	**Subaru GL 4WD Turbo, A/T**
.19	**Group Average**

TCC	Over $25,000
.08	**BMW 533i, 5-spd man.**
.07	Porsche 911 Carrera
.04	Porsche 928S, 5-spd man.
.04	Jaguar XJ-S, A/T
.04	Porsche 928S, A/T
.03	**Mercedes 500 SEC**
.05	**Group Average**



AI's Total Car Coefficient

Some Examples

by Lance A. Ealey

The big winner in *AI's* Total Car Coefficient (TCC) rating this year is the Plymouth Horizon with 2.2-L four and 5-speed manual transaxle. The Horizon racked up a best ever TCC of .41, well above last year's two winners, the Toyota Tercel Deluxe and the Dodge Omni 2.2-L, both of which earned .37 TCCs (see April '83, "AI's Total Car Coefficient Sums It Up," p. 24-B).

The TCC formula is: (interior volume x mpg) ÷ (0-60 mph time x price) x 10 = TCC.

Interior volumes and city mpg figures come from the EPA, retail FOB or POE prices are taken from the *Kelley Blue Book Fourth Edition*. The only options figured into the base retail price were those affecting performance—engine, transmission, etc.

Zero to 60 mph times were generated by *AI* with an appreciated assist from PBS's *MotorWeek*. Additional, hard to get figures were taken from various enthusiast magazines. We multipy the result by 10 simply for readability.

The Toyota Tercel we tested this year was the SR5 model, which rated a TCC of .29. The interior volume and city mpg for the '83 and '84 models were identical. However, the car tested last year was a second faster to 60 mph, and its price was almost $1000 less than the 1984 SR5.

The Horizon's 0-60 time was the key to why it beat last year's Omni. It was almost a second quicker. The only other variable was the Horizon's slightly lower price.

The Chevy Monte Carlo SS, Mercury Marquis, Ford LTD LX, Buick Skyhawk and VW Scirocco all earned .17 TCCs, with the spread going from 0-60 times of 15.9 to 8.8 seconds, fuel economy from 27 to 17 mpg, interior volumes from 73 to 97 cu ft and prices from $8472 to $10,870.

That all 5 cars earned similar TCCs shows how negative attributes can be balanced by positive ones when all four TCC values are taken into account. Obviously, one would not group a Volkswagen Scirocco with a Mercury Marquis—the cars are targeted for very different audiences. Nevertheless, their TCCs indicate a balancing factor between the two. For the VW, it was its performance and fuel economy; for the Marquis, interior volume and lower price were the keys. ■

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VOLVO																							
DL, GL (2D, 4D, Wagon)	USA *Metric*		FR	4	141 *2.3*	3.78x3.15 *96x80*	114@5400	133@3500	10.3	EFI	104.3 *2649*	56.3 *1430*	53.5 *1353*	188.8 *4795*	67.2 *1709*	56.4[4] *1427*	2888 *1327*	175SR14	Auto/Man	4/5	Strut	LA,CS	4WD
Diesel (4-Dr., Wagon)	USA *Metric*		FR	6	145 *2.4*	3.01x3.40 *76.5x86.4*	80@4800	103@2800	23.0	FI	104.3 *2649*	56.3 *1430*	53.5 *1353*	188.8 *4795*	67.2 *1709*	56.2[4] *1427*	3098 *1419*	185/70SR14	Auto/Man	3/5	Strut	LA,CS	4WD
GLT Turbo (2D, 4D, Wagon)[37]	USA *Metric*		FR	4	130 *2.1*	3.62x3.15 *92x80*	162@5100	181@3900	7.5	FI	104.3 *2649*	56.3 *1430*	53.5 *1353*	188.8 *4795*	67.2 *1709*	56.2[4] *1427*	2992 *1369*	195/60R15	Auto/Man	4/5	Strut	LA,CS	4WD
760 GLE Gas	USA *Metric*		FR	6	173 *2.8*	3.58x2.87 *91x73*	134@5500	159@2750	8.8	FI	109.1 *2771*	57.5 *1460*	57.5 *1460*	188.4 *4785*	68.9 *1750*	55.5 *1409*	2979 *1352*	195/60R15	Auto.	4	Strut	LA,CS[38]	4WD
760 GLE Turbo Diesel	USA *Metric*		FR	6	145 *2.4*	3.01x3.40 *76.5x86.4*	106@4800	140@2400	23.0	FI	109.1 *2771*	57.5 *1460*	57.5 *1460*	188.4 *4785*	68.9 *1750*	55.5 *1409*	3221 *1431*	195/60R15	Auto/Man	4/5	Strut	LA,CS[38]	4WD

ABBREVIATIONS:

A—"A" Arm
ARB—Anti-Roll Bar
Auto—Automatic
BA—Beam-Type Axle
BL—Bar link
CFI—Continuous fuel injection
CS—Coil Spring
DA—Double "A" Arms
DD—De Dion
DF—Disc front/drum rear
DLX—Deluxe
DPA—Diagonal pivot axle
EFI—Electronic fuel injection
F—France
FI—Fuel injection
FL—Fixed length drive shaft
FR—Front
GB—Great Britain
H—Hydraulic shocks
I—Italy
Ind—Independent
IS—Integral stabilizer
IW—Independent wishbone
J—Japan
L—4-link
LA—Live axle
LL—Lateral link
LS—Leaf spring
LTR—4 links with track rod
Man—Manual
MFI—Mechanical fuel injection
MID—Midship
NI—Northern Ireland
NR—Negative rolling radius
RO—Rotary Engine
R—Rear
RA—Rigid axle
RTB—Rear torsion bar
S—Sweden
SB—Stabilizer bar
STA—Semi-trailing arms
T—Trailing arms
TBA—Torsion Beam Axle
TBI—Throttle body fuel injection
TBS—Torsion bar spring
TCA—Torsion crank axle
TTL—Twin trapezoidal links
TW—Trailing arms and watt links
UW—Unequal length wishbone
V—Ventilated disc
W—Upper & lower wishbone
WG—West Germany
4WD—4-wheel disc
4WD-R—4-wheel disc, inboard at rear

FOOTNOTES:

[1]—Automatic available
[2]—Lower wishbone
[3]—Panhard rod
[4]—4-speed automatic available
[5]—Diesel available, 6 cyl, 2.8-L, 80 hp @ 4800 rpm, 120 lb ft @ 2400 rpm
[6]—Turbo: 200 hp @ 5200 rpm, 227 lb ft @ 3000, 7.8:1 compression
[7]—Hatchback 2-dr Deluxe width: 65.2 in.
[8]—Hatchback height: 53.3 in.
[9]—Borg-Warner 5-spd man. available on Turbo
[10]—Hatchback: 175/70SR13
[11]—Turbo: 2-seater, 2992 lb
[12]—Mpg 2-dr: 1840 lb; STD 2-dr: 1850 lb; STD 4-dr: 1855 lb; Hatchback: 1915 lb
[13]—2-dr Deluxe: 2190 lb; 4-dr Deluxe: 2215 lb
[14]—Standard, other sizes available
[15]—see US listings for 4-dr Accord
[16]—Touring Sedan & Coupe: 53.7 in.
[17]—Coupe: 2385 lb
[18]—GLC Sport Coupe & Sport Sedan: 175/70SR13
[19]—Listed tires are for S; GS and GSL get 185/70HR13
[20]—Deluxe: 185/70HR14
[21]—49 states: 2445 lb or 110 kg; CA: 2435 lb or 1105 kg
[22]—GSL model has 4WD
[23]—4+4 and 3-speed automatic available
[24]—5-speed manual & 3-speed automatic available
[25]—175SR14 for 505GL & 505S sedan; 190/65 x 390 for 505STI
[26]—4WD on 505S & STI; front disc, rear drum on 505GL
[27]—With manual trans.; 3385 lb with automatic
[28]—See US listings for Alliance and Encore
[29]—195/60SR15 or 3-dr Turbo
[30]—Liftback: 176.6 in.
[31]—SR5 Liftback height: 54.7 in; weight: 2025 lb
[32]—Liftback GT: 2566 lb; GT-S: 2705 lb
[33]—5-speed manual available on sedan
[34]—See US listings for Rabbit specs
[35]—For station wagons: 180.2 in. or 4580 mm
[36]—For station wagons: 2601 lb or 1181 kg
[37]—With intercooler
[38]—Constant track system with wishbone subframe, trailing arms and panhard rod
[39]—4-speed overdrive
[40]—Sold by Chrysler Corp. in the US

US Passenger Car Production

(by quarter, 1965-1983)

Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total Year
1965	2,561,886	2,599,819	1,547,514	2,626,008	9,335,227
1966	2,495,224	2,426,637	1,256,834	2,426,017	8,604,712
1967	1,873,314	2,171,685	1,249,330	2,118,330	7,412,659
1968	2,320,644	2,522,814	1,480569	2,524,593	8,848,620
1969	2,319,226	2,209,639	1,557,543	2,137,984	8,224,392
1970	1,780,719	2,187,676	1,215,983	1,365,750	6,550,128
1971	2,346,293	2,332,614	1,729,291	2,175,455	8,583,653
1972	2,264,286	2,428,258	1,686,833	2,448,828	8,828,205
1973	2,710,004	2,707,739	1,897,873	2,351,536	9,667,152
1974	1,787,291	2,058,591	1,663,008	1,815,614	7,324,504
1975	1,298,538	1,833,297	1,663,119	1,921,997	6,716,951
1976	2,171,737	2,423,233	1,727,053	2,175,870	8,497,893
1977	2,336,842	2,638,411	1,931,717	2,306,684	9,213,654
1978	2,267,541	2,659,293	1,851,391	2,398,410	9,176,635
1979	2,411,032	2,483,132	1,655,922	1,883,576	8,433,662
1980	1,786,357	1,632,779	1,260,070	1,696,300	6,375,506
1981	1,553,969	2,019,828	1,380,321	1,299,020	6,253,138
1982	1,070,995	1,566027	1,233,736	1,202,758	5,073,516
1983	1,501,710	1,775,840	1,595,422	1,908,032	6,781,044

Source: Motor Vehicle Manufacturers Assoc.

U.S. PASSENGER CARS
1983 Model Year Factory Installation of Optional Equipment
Shown in Per Cent of Each Makes Production

MAKE	TRANSMISSIONS					ENGINES			POWER OPERATED								
	Automatic	Manual 3-speed	Manual 3-Speed w/ Overdrive Unit	Manual 4-Speed	Manual 5-Speed	V-8	6-Cylinder	4-Cylinder	Brakes	Steering	Windows*	Seats	Air Conditioning	Tinted Glass	Locking Differential	Movable Steering Column	Disc Brakes
CHRYSLER CORP.																	
Chrysler																	
Cordoba	100.0	N.O.	N.O.	N.O.	N.O.	90.2	9.8	N.O.	100.0	100.0	71.3	59.8	97.2	100.0	N.O.	77.8	100.0
E Class/New Yorker	100.0	N.O.	N.O.	N.O.	N.O.	N.O.	N.O.	100.0	100.0	92.6	61.6	51.0	96.6	99.2	N.O.	73.8	100.0
Imperial	100.0	N.O.	N.O.	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	N.O.	100.0	100.0
LeBaron	98.8	N.O.	N.O.	N.O.	1.2	N.O.	N.O.	100.0	100.0	100.0	40.1	26.0	92.7	97.9	N.O.	58.3	100.0
New Yorker 5th Ave	100.0	N.O.	N.O.	N.O.	N.O.	98.0	2.0	N.O.	100.0	100.0	100.0	93.5	100.0	100.0	N.O.	95.1	100.0
Dodge																	
Aries	91.7	N.O.	N.O.	5.7	2.6	N.O.	N.O.	100.0	100.0	96.0	2.1	0.7	73.0	81.9	N.O.	12.3	100.0
Diplomat	100.0	N.O.	N.O.	N.O.	N.O.	65.4	34.6	N.O.	100.0	100.0	14.7	5.7	89.2	100.0	12.9	35.1	100.0
Mirada	100.0	N.O.	N.O.	N.O.	N.O.	82.4	17.6	N.O.	100.0	100.0	53.3	66.5	94.2	100.0	N.O.	69.1	100.0
Onmi/Charger	44.6	N.O.	N.O.	16.4	39.9	N.O.	N.O.	100.0	100.0	66.4	N.O.	N.O.	38.1	76.9	N.O.	N.O.	100.0
400	96.4	N.O.	N.O.	N.O.	3.6	N.O.	N.O.	100.0	100.0	99.2	28.3	14.4	83.2	96.4	N.O.	51.4	100.0
600	92.7	N.O.	N.O.	N.O.	7.3	N.O.	N.O.	100.0	100.0	100.0	33.0	22.5	91.8	97.2	N.O.	57.6	100.0
Plymouth																	
Gran Fury	100.0	N.O.	N.O.	N.O.	N.O.	71.1	28.9	N.O.	100.0	100.0	14.4	N.O.	89.4	100.0	26.4	29.7	100.0
Horizon/Turismo	54.6	N.O.	N.O.	18.8	26.6	N.O.	N.O.	100.0	100.0	63.5	N.O.	N.O.	39.2	72.5	N.O.	N.O.	100.0
Reliant	93.5	N.O.	N.O.	4.5	2.4	N.O.	N.O.	100.0	99.6	96.1	1.2	0.5	76.4	83.4	N.O.	11.5	100.0
FORD MOTOR CO.																	
Ford																	
Escort	46.0	N.O.	N.O.	34.4	19.6	N.O.	N.O.	100.0	70.7	59.2	N.O.	N.O.	42.9	50.6	N.O.	N.O.	100.0
EXP	17.8	N.O.	N.O.	12.3	69.9	N.O.	N.O.	100.0	100.0	63.5	N.O.	N.O.	41.7	70.7	N.O.	N.O.	100.0
Fairmont	98.9	N.O.	N.O.	1.1	N.O.	N.O.	85.8	14.2	100.0	99.5	1.8	0.6	88.2	91.9	1.1	14.4	100.0
LTD	47.4	N.O.	52.3	0.3	N.O.	N.O.	55.9	44.1	100.0	99.8	26.7	11.9	93.9	96.9	2.1	58.0	100.0
LTD Crown Victoria	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	61.1	55.2	97.9	98.4	8.2	68.5	100.0
Mustang	56.0	N.O.	N.O.	24.2	19.8	30.3	44.0	25.7	96.8	97.5	26.1	N.O.	76.2	88.4	32.1	42.5	100.0
Thunderbird	31.7	N.O.	58.0	N.O.	10.3	31.9	57.8	10.3	100.0	100.0	67.2	58.6	96.5	98.3	12.8	81.3	100.0
Tempo ('84)	72.6	N.O.	N.O.	1.0	26.4	N.O.	N.O.	100.0	100.0	98.5	5.3	2.9	77.8	91.6	N.O.	27.0	100.0
Lincoln																	
Continental	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	5.9	100.0	100.0
Mark VI	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	7.4	100.0	100.0
Town Car	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	3.3	98.8	100.0
Mercury																	
Capri	54.8	N.O.	26.4	15.0	3.8	24.9	43.0	32.1	100.0	87.5	11.9	N.O.	77.3	92.1	29.9	34.9	100.0
Cougar	41.9	N.O.	58.1	N.O.	N.O.	34.4	65.6	N.O.	100.0	100.0	72.7	49.2	97.6	98.5	2.5	77.5	100.0
LN7	20.4	N.O.	N.O.	N.O.	79.6	N.O.	N.O.	100.0	100.0	66.1	N.O.	N.O.	60.3	100.0	N.O.	N.O.	100.0
Lynx	50.3	N.O.	N.O.	27.2	22.5	N.O.	N.O.	100.0	67.3	67.3	N.O.	N.O.	51.9	56.2	N.O.	N.O.	100.0
Gran Marquis	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	88.8	99.7	99.6	5.5	96.0	100.0
Marquis	39.0	N.O.	60.7	0.3	N.O.	N.O.	95.7	4.3	100.0	100.0	44.5	31.3	93.9	92.1	2.0	73.3	100.0
Zephyr	99.5	N.O.	N.O.	0.5	N.O.	N.O.	89.4	10.6	100.0	99.8	2.6	0.6	94.8	85.9	0.6	19.6	100.0
Topaz ('84)	72.6	N.O.	N.O.	1.0	26.4	N.O.	N.O.	100.0	100.0	98.5	5.3	2.9	77.8	91.6	N.O.	27.0	100.0
GENERAL MOTORS CORP.																	
Buick																	
Century	99.7	N.O.	0.3	N.O.	N.O.	N.O.	75.0	25.0	100.0	100.0	41.3	27.2	96.2	97.6	N.O.	77.7	100.0
Electra	N.O.	N.O.	100.0	N.O.	N.O.	94.5	5.5	N.O.	100.0	100.0	100.0	98.4	100.0	100.0	5.2	98.8	100.0
LeSabre	59.0	N.O.	41.0	N.O.	N.O.	74.5	25.5	N.O.	100.0	100.0	61.9	55.4	99.0	99.3	3.0	86.1	100.0
Regal	98.4	N.O.	1.6	N.O.	N.O.	2.2	97.8	N.O.	100.0	100.0	47.5	28.6	97.5	98.5	2.0	78.3	100.0
Riviera	N.O.	N.O.	100.0	N.O.	N.O.	91.1	8.9	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	N.O.	100.0	100.0
Skyhawk	78.4	N.O.	N.O.	5.9	15.7	N.O.	N.O.	100.0	100.0	97.3	9.3	4.1	79.8	89.3	N.O.	48.3	100.0
Skylark	97.6	N.O.	N.O.	2.4	N.O.	N.O.	53.6	46.4	100.0	100.0	11.4	5.6	89.3	93.2	N.O.	55.9	100.0
Estate Wagon	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	84.9	83.7	100.0	100.0	13.8	90.7	100.0
Cadillac																	
Cimarron	83.0	N.O.	N.O.	N.O.	17.0	N.O.	N.O.	100.0	100.0	100.0	87.9	83.8	100.0	100.0	N.O.	94.0	100.0
Comm. Chassis	100.0	N.O.	N.O.	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	N.O.	N.O.	100.0	100.0	.44	100.0	100.0
DeVille	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	N.O.	91.6	100.0
Eldorado	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	N.O.	97.5	100.0
Fleetwood Brougham	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	N.O.	93.0	100.0
Fleetwood Limo	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	N.O.	95.7	100.0
Seville	N.O.	N.O.	100.0	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	N.O.	98.2	100.0
Chevrolet																	
Camaro	76.7	N.O.	N.O.	2.5	20.8	58.4	53.2	6.4	100.0	100.0	45.1	12.0	83.4	93.8	12.3	73.2	100.0
Caprice/Impala	100.0	N.O.	N.O.	N.O.	N.O.	85.9	14.1	N.O.	100.0	100.0	52.0	35.8	96.7	95.5	5.5	70.2	100.0
Cavalier	73.6	N.O.	N.O.	13.7	12.7	N.O.	N.O.	100.0	100.0	90.2	11.2	1.5	64.7	77.7	N.O.	33.4	100.0
Celebrity	100.0	N.O.	N.O.	N.O.	N.O.	N.O.	64.4	35.6	100.0	100.0	18.0	6.3	93.1	93.4	N.O.	55.5	100.0
Chevette	61.2	N.O.	N.O.	34.8	4.0	N.O.	N.O.	100.0	13.9	16.7	N.O.	N.O.	38.6	44.9	N.O.	10.0	100.0
Citation	89.7	N.O.	N.O.	10.3	N.O.	N.O.	43.1	56.9	95.6	98.4	2.9	N.O.	75.7	79.3	N.O.	24.8	100.0
Corvette ('84)	99.8	N.O.	N.O.	0.2	N.O.	100.0	N.O.	N.O.	100.0	100.0	100.0	94.5	100.0	100.0	100.01	100.0	100.0
Malibu	100.0	N.O.	N.O.	N.O.	N.O.	27.4	71.8	N.O.	100.0	100.0	7.9	0.1	84.7	84.9	4.1	34.3	100.0
Monte Carlo	100.0	N.O.	N.O.	N.O.	N.O.	47.6	52.4	N.O.	100.0	100.0	90.1	11.8	92.4	90.1	3.1	66.2	100.0
Oldsmobile																	
Custom Cruiser	0.2	N.O.	99.9	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	77.7	69.7	98.9	98.6	12.8	84.0	100.0
Cutlass Ciera	99.9	N.O.	.03	N.O.	N.O.	N.O.	57.7	42.3	100.0	100.0	40.7	0.2	95.9	97.4	N.O.	78.3	100.0
Cutlass Supreme	99.0	N.O.	1.0	N.O.	N.O.	22.7	77.3	N.O.	100.0	100.0	42.1	22.7	98.4	98.2	2.7	76.8	100.0
Delta 88	66.1	N.O.	33.9	N.O.	N.O.	94.7	5.3	N.O.	100.0	100.0	65.0	54.8	98.5	98.9	3.4	87.3	100.0
Firenza	79.8	N.O.	N.O.	4.6	15.6	N.O.	N.O.	100.0	100.0	97.8	7.0	2.9	78.2	84.4	N.O.	58.0	100.0
98	N.O.	N.O.	100.0	N.O.	N.O.	99.5	0.5	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	4.9	97.5	100.0
Omega	97.4	N.O.	N.O.	2.6	N.O.	N.O.	41.0	59.0	100.0	100.0	9.2	2.2	85.9	88.7	N.O.	52.8	100.0
Toronado	N.O.	N.O.	100.0	N.O.	N.O.	99.3	0.7	N.O.	100.0	100.0	100.0	100.0	100.0	100.0	N.O.	100.0	100.0
Pontiac																	
Bonneville	100.0	N.O.	N.O.	N.O.	N.O.	41.3	58.7	N.O.	100.0	100.0	50.5	32.5	98.1	98.6	3.5	76.2	100.0
Firebird	80.8	N.O.	52.0	1.5	17.6	54.7	29.1	11.2	100.0	100.0	56.1	8.3	91.3	97.4	26.0	72.5	100.0
Grand Prix	100.0	N.O.	N.O.	N.O.	N.O.	41.1	58.7	N.O.	100.0	100.0	61.2	28.5	97.9	98.6	3.0	83.2	100.0
Parisienne	100.0	N.O.	N.O.	N.O.	N.O.	96.1	3.9	N.O.	100.0	100.0	78.5	67.2	99.5	99.6	39.2	94.2	100.0
Phoenix	94.1	N.O.	5.9	N.O.	N.O.	N.O.	32.0	68.0	98.8	100.0	5.4	2.8	89.1	94.0	N.O.	17.1	100.0
1000	59.7	N.O.	N.O.	34.1	6.1	N.O.	N.O.	100.0	17.9	31.4	N.O.	N.O.	51.3	58.8	N.O.	17.1	100.0
2000	69.2	N.O.	N.O.	3.3	27.5	N.O.	N.O.	100.0	100.0	93.1	6.6	1.5	76.4	87.3	N.O.	47.9	100.0
6000	100.0	N.O.	N.O.	N.O.	N.O.	N.O.	56.7	43.3	100.0	100.0	47.1	16.3	97.3	98.3	N.O.	75.6	100.0
VOLKSWAGEN																	
Rabbit hatchback	14.5	N.O.	N.O.	26.4	59.1	N.O.	N.O.	100.0	100.0	21.4	N.O.	N.O.	38.5	100.0	N.O.	N.O.	100.0
Rabbit GTI	N.O.	N.O.	N.O.	N.O.	100.0	N.O.	N.O.	100.0	100.0	N.O.	N.O.	N.O.	53.9	100.0	N.O.	N.O.	100.0

* Not offered as standard or optional equipment.

CHILTON'S 5/1984

AUTOMOTIVE INDUSTRIES

NUMBER ONE IN THE INDUSTRY SINCE 1895

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4/13/84
C2150-3A

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CONFLICT OR COOPERATION?

VW & Honda Compared:
PLANTING ROOTS IN AMERICA

AMERICAN STEEL FIGHTS BACK!

INCLUDING TRUCK & OFF-HIGHWAY INDUSTRIES

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NEXT MONTH

Our fabulous Source Guide is completely reorganized to make it a more useful and readable source of auto supplier info.

QUOTABLE

"If every other player in our market were to join up with Chrysler, and I mean Ford and AMC, and VW, all the other Japanese, Honda, Nissan, Mazda, Peugeot, Volvo, Mercedes, Rolls Royce and *every* other car maker in the world, we still wouldn't have as much US market share as GM and Toyota combined."—Chrysler chairman Lee Iacocca testily testifying at a hearing on the GM/Toyota joint venture and its effects on the US auto industry, in Washington, DC.

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AMERICAN STEEL FIGHTS BACK!

With rationalization and modernization, the American steel industry is slowly rebuilding its competitive strength, and the price and quality of its products.

by George McManus

"The steel industry is doing just what it should be doing," says Roger B. Smith, chairman of General Motors.

"They're rationalizing their volume, their capacity. They're modernizing and they're coming in with new equipment."

Steel companies are doing these things and they're doing them in a hurry. Surplus, high cost facilities are being retired. Just in the past year or so, shutdowns have reduced capacity by 15 million tons (*13.6 million t*).

Production is being consolidated in the most efficient facilities. As one way of doing this, two large mergers have been proposed. United States Steel Corp. proposed buying the steel operation of National Intergroup Inc. LTV Corp., which owns Jones & Laughlin Steel Corp., announced a merger with Republic Steel Corp.

Modernization Push

The merger push is on hold pending anti-trust rulings, but modernization programs are going forward. A massive conversion to continuous casting is underway. A basic change is taking place in steel refining.

Steel companies have been doing one more important thing—cutting prices. As of February, discounts up to $100 a ton were being offered on sheet products. The average price of sheet was no higher than it was in 1981.

Despite losing $6 billion over the

Bethlehem Steel's continuous heat-treating line at Burns Harbor, IN. With continuous annealing, it is possible to produce a sheet that is soft and formable out of the mills, but which rapidly work hardens in auto presses.

George McManus is Steel Editor of Chilton's Iron Age *magazine.*

One-sided galvanized produced at National Steel's Midwest Plant. Before there is a full conversion to electrolytic coating, there will have to be decisions on exactly what kind of coating the automakers want.

past 2 years, the steel industry is in a very dynamic state. Typical of the new mood is the response to the auto industry's call for better corrosion resistance.

The auto companies want a coated sheet that is paintable, weldable and formable. The best way of meeting these requirements seems to be with electrolytic galvanizing. Nearly all the coating lines right now are of the hot dip variety.

Accordingly, a big electrolytic program has been started. Bethlehem Steel Corp. and Inland Steel Co. have joined in a development program for electrolytic coating. Separate from this, Bethlehem is converting a tinplate line at Burns Harbor, IN to electrolytic galvanizing.

National Intergroup has launched an electrolytic project at its Great Lakes plant. Wheeling-Pittsburgh Steel Corp. has joined with Nisshin Steel Corp. Ltd. of Japan in a venture for coated sheet.

Beyond this change and consolidation there are bright spots of increased employment beginning to appear in the domestic steel industry. On March 18, Weirton Steel Corp. called back 143 of its workers. This was due to the start-up of the rebuilt No. 3 blast furnace. (With this furnace operating, Weirton will have four blast furnaces running for the first time since 1979.)

This latest recall brings Weirton's active workforce to 7777. About 600 have been called back as a result of the improvement in the sheet market, although there are still 1386 on layoff.

All this is good timing for Weirton which recently severed ties with National Intergroup, and began operating as the largest employee-owned corporation in the US.

Rationalization Push

In the American steel industry as a whole, rationalization continues as a response to the market. Since the start of 1982, the steel market has taken an average of about 65 million tons of steel a year (*59.0 million t/yr*). In the 1973 boom, domestic mills shipped over 111 million tons of finished steel and produced over 150 million tons of raw steel (*100.7 million and 136.1 million t*).

The current imbalance of supply and demand has created intense market pressures. One result has been the price cutting. Another effect has been plant shutdowns—the 15 million tons scratched last year was on top of a 10-million-ton subtraction earlier.

Consolidation of the remaining capacity will probably extend across company lines. David M. Roderick, chairman of US Steel, believes mergers are a must.

"Economically rational mergers will create a more efficient industry," says Roderick. "The preservation of all efficient domestic productive units is a pro-competitive policy."

If large steel mergers are blocked by the government, there could be a pooling of resources through joint ventures and through a sharing of production. A number of domestic mills bought foreign slabs last year. Steel structurals were sold within the domestic industry.

The positive side of steel restructuring is modernization of the remaining facilities. Considering the financial state of the steel industry, the modernization effort is truly remarkable.

Continuous Casters Come On

Something like 20 large continuous casters have been installed recently or are now in the works. Much of this activity involves slab machines for sheet products.

Big slab casters were started in the last few months at the Indiana Harbor plant of Jones & Laughlin and at the Cleveland plant of Republic Steel. Earlier, slab machines came on stream at the Great Lakes and Granite City plants of National Intergroup.

Coming up are slab casters for US Steel at Gary, IN and at Fairfield, AL; for Bethlehem Steel at Burns Harbor and at Sparrows Point, MD; for Inland Steel; and for the Rouge Steel plant of Ford Motor Co.

Continuous casting lowers the cost of producing sheet by giving 10-15% more usable steel. "Continuous casting makes possible high yield, energy [savings] and other cost savings," says Robert C. Wilkins, finance VP of Bethlehem. "These savings amount to about $35 to $40 on each ton."

Bethlehem's casting program points up the bold manner in which steel companies are going about their modernization. Bethlehem's $540 million outlay for casters will be provided entirely by borrowing. Under a novel financing scheme, repayment will be tied to tons produced on the casters. No money will be paid until the casters start producing tons and generating savings.

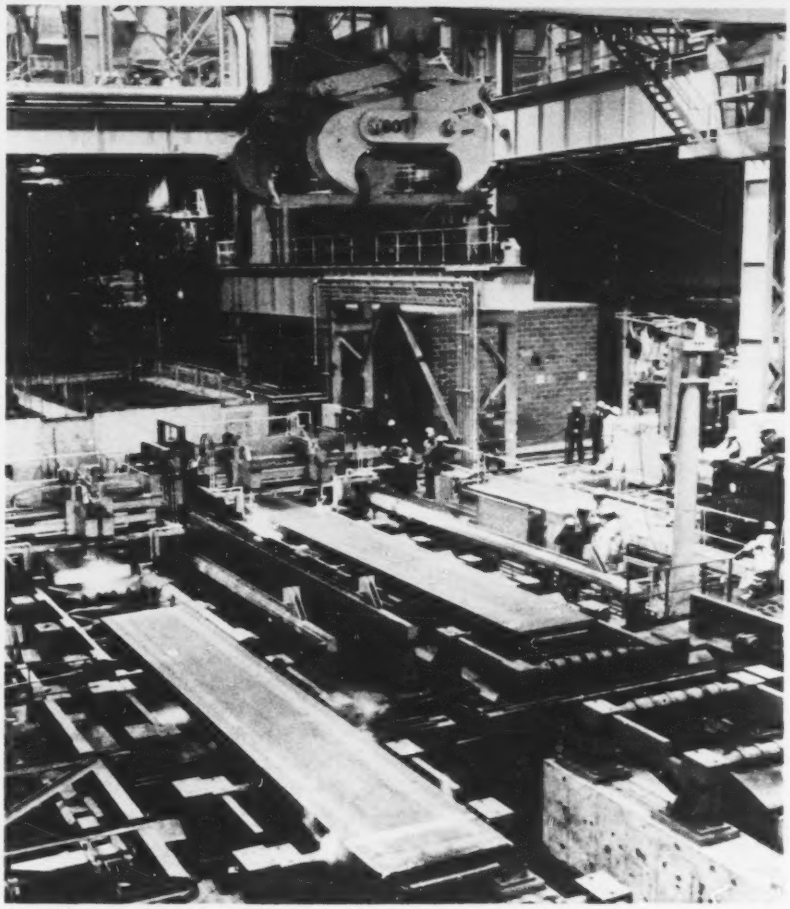
This is heady stuff in an industry that has generally followed a pay-as-you-go policy in capital spending. With internal funds depleted and with urgent modernization needs, steel companies have concluded they must base their spending on expectations. Most of the big mills are availing themselves of the generous financing available from foreign equipment suppliers.

Quality Up

Continuous casting also improves quality. The quality aspect was noted when US Steel announced an upgrading of its first caster at Gary.

"Changes in markets require a quality of steel which can be viably produced only from aluminum killed continuously cast slabs," says R.W. Smith, who was then US Steel's group VP, steel. "The most significant change is evolving in the automotive market with the increased use of high strength steels to reduce the weight of cars."

At the December startup of J&L's Indiana Harbor caster, cost savings were noted by David H. Hoag, presi-



Republic Steel's new continuous slab caster was officially dedicated in December at its Cleveland steel plant. Continuous casting lowers the cost of producing sheet by giving 10-15% more usable steel.

dent. "Equally important," says Hoag, "is the more consistent surface quality the cast slabs permit us to deliver to customers in our finished products. With the caster up and running, J&L will be able to provide quality products equal to any in the world."

Uniform Chemistry A Plus

Continuous casting provides uniform chemistry and a uniform internal structure. Rapid solidification inhibits the congregating of impurities and the growth of coarse grains. The continuously cast product is preferred by a growing number of sheet users.

Apart from direct quality gains, continuous casting is closely tied to ladle metallurgy. Partly to facilitate efficient casting, steel companies have installed a variety of ladle treatment stations. These provide a buffer between the batch melting furnaces and the continuous casters.

In addition to smoothing out the overall operations, the ladle systems make for better quality. Under the practice rapidly being adopted, electric furnaces and oxygen furnaces are being used primarily for rapid melting and partial refining of the steel. The final alloying and cleansing of the steel is then done in the ladle. Temperatures are adjusted. Desulfurizers and deoxidizers are injected. The steel is mixed and rinsed.

The result is a very clean steel with precise control of chemistry. A number of small, subtle changes are bringing a significant improvement in quality. Sheet users are assured of uniform directional properties because sulfur content can be reduced to low levels in the ladle systems and sulfur shape can be controlled.

Total Yearly Automotive Steel Shipments

(thousands of net tons)

Year	Tons
1983	12,076
1982	9,288
1981	13,154
1980	12,124
1979	18,621
1978	21,253
1977	21,490
1976	21,351
1975	15,214
1974	18,928
1973	23,217

Source: AISI

Producing Galvanized Sheet

Ladle degassing is one way of producing the formable galvanized sheet required by the auto industry. With vacuum degassing, the carbon content of the steel can be pulled way down. If a pinch of columbium or titanium is added to the low carbon steel, good forming properties are retained in the galvanizing process.

This is important. Electrolytic coating may be the wave of the future but people are going to have to live with the hot dip process for some time. Before there is a full conversion to electrolytic, there will have to be decisions on exactly what kind of coating is best.

Zinc will probably remain the big protective agent but various combinations of nickel and chromium are being considered. Steel companies must stay flexible because the auto industry has been known to change its mind.

At one time, it appeared that one-side galvanized was the ideal product for auto body protection. The uncoated sheet surface would be painted and used on the outside. The coated surface would be used inside to fight corrosion.

One-side coating systems were developed by US Steel and Armco Inc. Enough of the one-side product is being used to keep both lines fully loaded, but for the corrosion guarantees expected on 1987 car models, a sheet coated on both sides will probably be needed.

(Continued)

Continuous Annealing For HSS

Continuous annealing provides another example of changing requirements. A few years ago, weight reduction was a major objective in Detroit. High strength steel was seen as one of the best answers to shedding excess pounds.

As a means of providing the high strength sheet, Bethlehem and Inland installed continuous annealing lines. By rapidly heating and cooling steel, these lines can develop extra strength without expensive alloy additions.

Of special interest was something called dual phase steel. With continuous annealing, it was possible to produce a sheet that was soft and formable out of the mills, but which rapidly worked hardened in auto presses.

The continuous lines came on stream in the first half of 1983. The auto industry was still emerging from its deep slump at that time. This timing was probably a factor but it appeared to steel people that the auto companies had lost some of their enthusiasm for high strength sheet. The dual phase grade seemed to have fallen out of favor.

The last word isn't in on high strength steel or continuous annealing. For a variety of reasons, the product and the process will almost certainly find widespread use. Nevertheless, the experience of the last few years has shown that the priorities of auto companies can change very quickly.

Revolution Coming

Down the road for sheet producers and sheet users may be a revolutionary development. A program sponsored by the Department of Energy calls for casting molten steel directly into thin sheet.

As it is now, sheets are made by taking large ingots or slabs and mashing them into thin material. The need for this compacting is one thing that has shaped the steel industry. Slabs are rolled into sheet or hot strip mills. These are high cost, high production machines. A single strip mill can cost half a billion dollars and roll 5 million tons a year (*4.5 million t/yr*).

Because of these numbers, steel sheet is made in large plants by large companies. Enormous amounts of energy are consumed in the hot rolling.

Bypassing The Strip Mill

The aim now is to bypass the strip mill by directly casting material measuring from .010-.187 in. (*.25-4.75 mm*) thick. With existing casters, the minimum thickness is 6 in. and on the new casters, a 10 in. slab is typical (*152 and 254 mm*).

In the new program, researchers are actually trying to scale up the techniques used by Allied Corp. in casting extremely thin foils. Allied takes a molten stream and plays it on a rapidly moving surface. The metal is cooled so fast it retains the amorphous structure of a liquid and has exceptional electrical properties.

Allied is working with exotic alloys and is producing strip only about .001 in. thick (*.025 mm*). Maximum width is about 7 in. (*178 mm*). The research program aims at producing sheet up to 72 in. (*1829 mm*) wide and about as thick as material coming off a strip mill.

Big Cost Reductions Possible

If successful, the thin casting program will bring big cost reductions. It will make it possible for small companies to produce sheet.

Some metallurgists feel this is all blue-sky romancing. Nevertheless a number of important people and companies are backing the strip casting program. US Steel and National Intergroup are among the companies which have made proposals to the Department of Energy.

In any case, the casting program brings out the active state of the industry. Steel people are receptive to change. One kind of change is consolidation by the tonnage producers. Among other things, this would seem to tie in with GM's plan for concentrating procurement.

At the same time, some types of steel production are being fragmented. Mini-mills have taken over a large portion of the merchant bar market and are moving into industrial bars.

Tonnage producers are withdrawing from the rod and wire markets. The mini-mills are expanding in these areas. A portion of the medium structural market is being taken over by mini-mills and imports.

Out of all this will hopefully emerge a steel industry that is smaller but strong and mobile. ■

Timken's Faircrest Plant—High Tech Americanism

Say "Timken" and nine out of ten people will say "ball bearings." But the company's been in the steel business since 1916 and expects to have its new $500 million Faircrest specialty alloy steel plant fully operational by late 1985.

"In the US, this is the only 'greenfield' integrated steel plant going up," says a Timken spokesman. Timken's investment in the plant, located near Canton, OH, equals roughly two-thirds of the company's present net worth.

(It's interesting to note that in 1982, the year the company broke ground for the new mill, Timken reported its first loss [$3 million] in 50 years. And while plans were slowed somewhat during the recession, the spokesman indicates the downturn didn't alter the overall plan.)

The plant's continuous thermal treatment (CTT) facility, which went operational late last year, produces bar and tubular steel. Facilities under construction now include a 160-ton (*145-t*) computer controlled electric arc furnace made by Krupp International Inc. of New York. This will increase Timken's total melting capacity from 1 million to 1.5 million tons per year (*907,000 to 1.4 million t*).

The plant will directly employ 400-500 workers initially, and 800 workers if full expansion plans are carried through. Its lower labor requirements as compared with traditional mills result from intense process computerization.

Timken is reportedly spending over $5.8 million on computer equipment and software. The CTT facility includes a computer controlled austenitizing furnace and the 1600-ft (*490-m*) rolling mill includes over 100 miles (*161 km*) of wiring conduit for the mill's electronic systems.

Significantly, Timken indicates over $16 million of it $500 million investment will go toward environmental controls. ■

—by Lance A. Ealey

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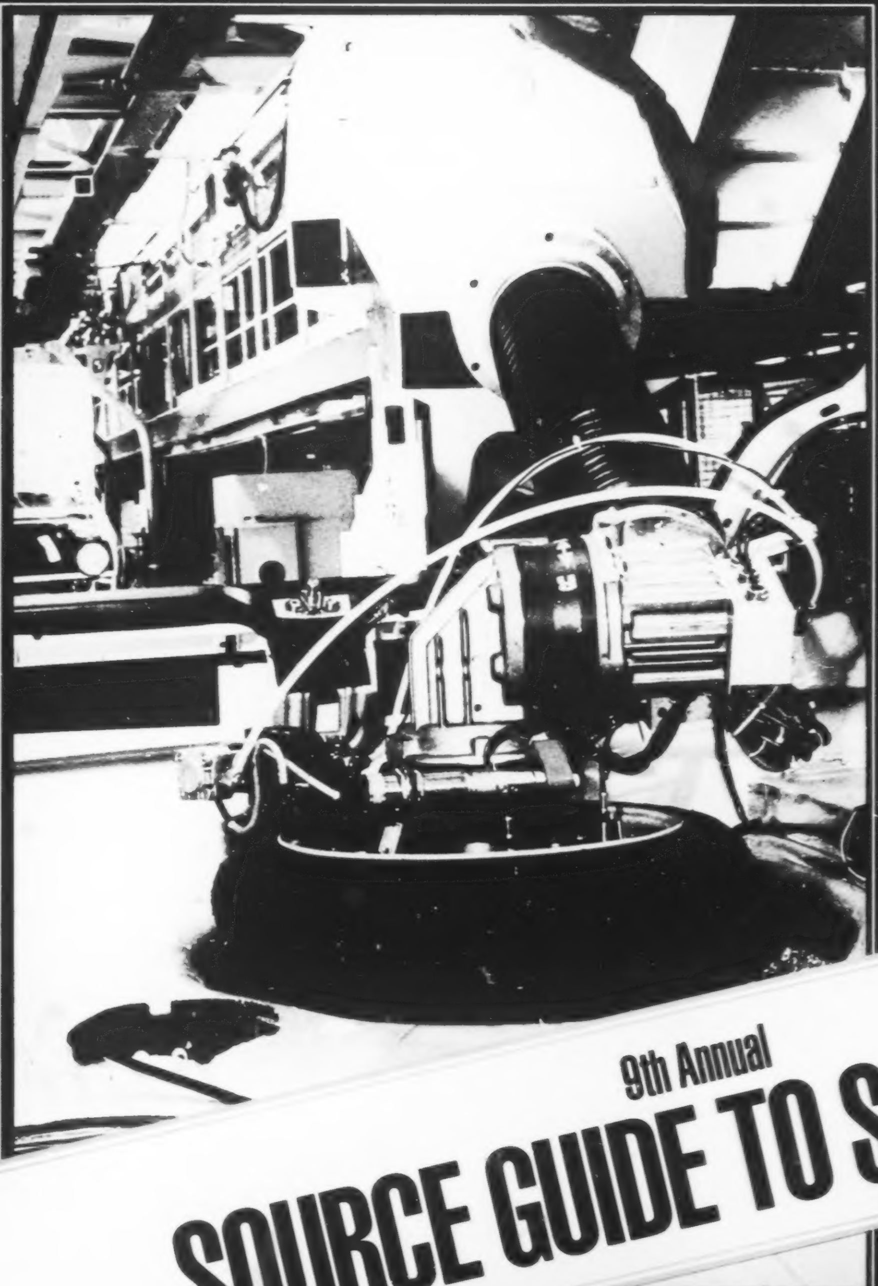
AUTOMOTIVE INDUSTRIES

NUMBER ONE IN THE INDUSTRY SINCE 1895

THE BIG BANG

GM's Plans Revealed

INSIDE THE WORLD'S MOST AUTOMATED ASSEMBLY PLANT



9th Annual

SOURCE GUIDE TO SUPPLIERS

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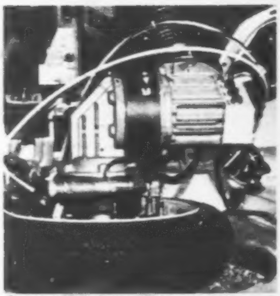
NEXT MONTH

What if . . . the Japanese import restraints are allowed to lapse? Will the orient unleash an onslaught of big *and* small cars?

QUOTABLE

Chrysler chairman Lee Iacocca, on the single most important reason for the company's dramatic turnaround—"When you're gonna die, it focuses your attention."

VWoA VP James Fuller on the fall and hopeful rise of his company—"German engineering is the base-rock of our company; we shouldn't forget it. When we have, it's been a terrible mistake."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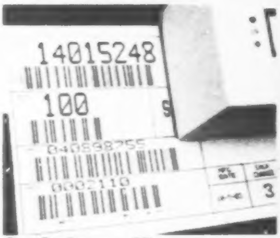

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Automotive Industries' Survey

ANALYSTS SEE CONTINUED UPSWING AND PROBABLE STRIKE

Major automotive analysts, surveyed by *AI*, see US car sales inching toward 8 million this year, and confirm the likelihood of a UAW strike at GM this fall.

by Neil M. Szigethy

Optimism reigns. While no one is really going out on a limb, and certainly most analysts qualify their forecasts with the ever popular "if interest rates don't continue upward," everyone is in general agreement that the industry is on a healthy upswing.

AI last surveyed auto analysts for our December '83 issue (see "Industry Analysts: Welcome To Easier Times," p. 63). Although the sampling was slightly different, we did ask for sales and production figures for the same period—calendar year 1984.

Forecasts Higher Now

On average, all the responses for our latest mid-year forecast are significantly higher than that earlier forecast, with the largest increase seen in total US and import truck sales.

A good example of the kind of optimism we recorded in our latest survey of auto analysts was the comments by Peggy Pentecost of the Automotive Information Council. "Despite a softening of the car sales rate in March," Pentecost said, "consumer auto buying attitudes remain high.

"The latest survey of public opinion on car and truck buying intentions, made by the University of Michigan's Institute For Social Research, found one of every six families indicated they intended to buy a new vehicle this year," she said.

Analysts See Steady Upswing (in millions)

Source: Automotive Industries Marketdata

	Arthur Andersen & Co.	Automotive Information Council	Chase Econometrics	Predicasts	Arthur D. Little	AP Parts Co.	Merrill Lynch	Manufacturers Hanover Trust	J.D. Power & Associates
PASSENGER CARS									
1984 US Production	7.8	7.7	8.0	7.95	7.6	7.5	8.0	7.9	7.8
1984 Sales, US & Imports	10.2	10.2	10.5	10.7	10.3	10.3	10.4	10.3	10.4
LIGHT TRUCKS									
1984 US Production	—	2.7	2.7	2.675	2.4	2.7	2.7	—	3.2
1984 Sales, US & Imports	—	3.1	3.7	3.2	2.95	3.5	3.5	—	3.8
Will The UAW Strike This Fall?	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Against Whom?	GM	—	GM	GM	—	GM	GM	—	Ford

Still, Pentecost added that qualifier—"However, sales could falter if interest rates rise substantially this year," she said.

The Spectre Of High Interest

Karl Motter Jr., manager of marketing information at AP Parts Co., elaborated on the threat of higher interest rates. "The large national debt still looms as the major enemy of the somewhat shaky interest rates," he said. "The prime rate will move up during the year as the government bids on the available funds. This will start to dampen consumer confidence in the latter part of 1984 and the beginning of 1985."

On a brighter note, Motter predicted stable fuel prices this year and next, plus he pointed to the explosion in interest in mini-vans.

"The mini-van appears to be *the* bright spot in new vehicle sales," he said. "Chrysler appears to have a step up on the other OEs with its front-wheel-drive offering. Room plus handling put it in first place."

On the question of whether the UAW will strike against GM or Ford this fall, we received a resounding agreement with our last month's informal poll (see May '84, "Strike Survey: Conflict Or Cooperation?" p. 24). Of the 11 analysts responding, eight, or 73%, said 'yes' with all but one of those indicating GM as the target. Comments by Predicasts' chief economist and research director were typical.

Rank-And-File Impatient

"Although UAW officials still talk of job security as being 'at the top of the agenda,' rank-and-file members have been getting impatient," said Predicasts' Thomas Kevin Swift. "They want to regain some of the billions in economic concessions made 2 years ago in exchange for somewhat improved job security.

"If rank-and-file members settle for nothing less than the previously surrendered $1.30 to $1.50 per hour concessions," he continued, "the competitive gap between domestic and Japanese producers would widen further. Any gains by the UAW beyond this would place the domestic industry on a noncompetitive footing even more serious than the one it was on 3 years ago.

"My view of the industry environment, consequently, indicates the impracticality and ill-timing of a strike by the UAW," Swift said. "However, hotter heads generally prevail in these matters. Consequently a strike will probably be likely against GM. September 14th should prove to be an interesting day in the industry's history indeed!" ■

Reported by Lori J. Roberts and Elizabeth Capelli

	Sanford C. Bernstein & Co.	Morgan Guaranty Trust	Average
	8.06 10.75	8.1 10.5	7.8 10.4
	2.3 3.5	3.3 3.8	2.7 3.5
	Yes	Yes	
	GM	GM	

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WHAT IF?

Will End Of Import Restraints Bring Japanese Onslaught?

Hot New Engine Trends: Variable Compression & Direct Injection

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From Nissan's large Cedric to Honda's hot little City Turbo II, from Subaru's innovative Justy 4wd to Mazda's sports/luxury Cosmo coupe—there's a world of Japanese cars not sold here.

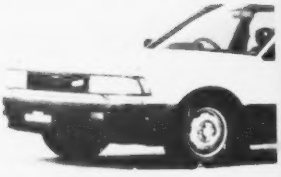
NEXT MONTH

What are the best, most productive machine tool systems (and assembly plants using them) worldwide? We examine that question, plus report on the International Machine Tool Show next month.

QUOTABLE

"One of the first records this management achieved was to lose $3½ billion."—vice chairman Gerald Greenwald on Chrysler's losses.

"Where in the hell do they think we got the capital to gamble on mini-vans at $700 million three years ago? We were crazy then because we figured we were so much in hock, what's another $700 million?"—chairman Lee Iacocca on Chrysler's profits.



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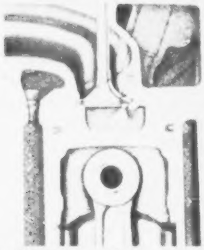

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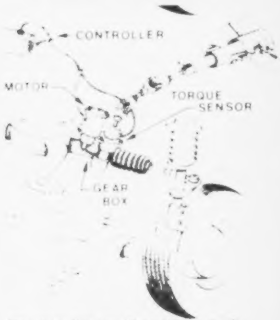

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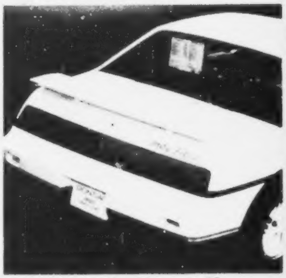

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AI MARKETDATA

Japanese Profits: 50% Come From US

"The US market will continue to be the biggest profit center for Japanese automakers, since total volume of imported Japanese cars will be fixed and demand for them will remain very strong," says Daiwa Securities Co. Ltd. of Tokyo. "Although total car exports to the US account for less than 20% of total shipments, more than half of total profits is estimated to come from the US market." Also: "Protectionist sentiment in the US and Europe and domestic production policies in developing nations will promote overseas production by Japanese automakers. Their overseas production is estimated to increase from 1.6 million units in 1983 to 3.8 million in 1988 with an annual compound rate of some 20% (their overseas production ratio will rise from 13% in 1983 to 24% in 1988). In particular, car production in the US is projected to amount to 800,000 units in 1988."

This Fall: The Rise of VWoA?

Rampant rumors regarding VW's revised Golf and Jetta, due in the US this October and January, respectively: Some sources claim the standard Golf (as VW's newest putter will probably be called in the US as well as Europe) will get a detuned GTI 1.8-L engine, which would likely mean the GTI will get an even hotter engine. The new Jetta, introduced in Europe at the Geneva Show, may be VW's real street fighter, though. In GLI trim it's rumored to get VW's hot 16-valve engine. (Audi's 4000 [Audi 80 in Europe] is also reskinned this summer and will likely use the 16-valver in US trim). Surprisingly, one company official admits that VWoA expects to sell more Jettas than Golfs in the US in calendar year '85.

World Growth Seen In Passenger Cars

World passenger car sales will reach over 31 million cars this year, says Data Resources International (DRI) of London. The bad news is, says DRI, "The cyclical rebound of the mature markets however will be spent by 1985. Over the decade the developed world will settle to growth rates ranging from 1½% to 2½%, whereas the rapidly developing economies of Asia/Pacific and some parts of Africa and the Middle East will grow at rates in the 6% to 7% average annual growth range."

As far as the actual making of cars goes, DRI notes the shift by carmakers toward building in the market country, *a la* Honda, Nissan, et al. "Final assembly, accounting for some third of the total value-added of a car, is now a capital intensive rather than labor intensive process," says DRI. "The labor input to final assembly is becoming much less important as a proportion of total cost, thus eroding the penalty of [producing] in a higher wage country."

	New Car Sales (Millions)			**Car Production (Millions)**		
	1983	**1984**	**1990**	**1983**	**1984**	**1990**
W. Germany	2.43	2.47	2.64	3.88	3.91	4.22
France	2.02	1.84	2.29	2.96	2.76	2.97
UK	1.79	1.71	1.81	1.05	1.06	1.04
Italy	1.58	1.66	1.79	1.40	1.48	1.63
W. Europe	10.47	10.44	11.61	11.10	11.05	11.87
USA	9.18	10.57	11.46	—	—	—
N. America	—	—	—	7.79	9.03	9.54
Japan	3.14	3.17	3.59	7.15	7.25	8.22
World	29.36	31.22	36.20	—	—	—

Source: DRI World Automotive Forecast Report May 1984

Buying Hol-Sale

In the future, new car dealers could use video simulation or even holography to display a car to a potential customer, predicts Dave Cole, director of the office for the study of transportation at the University of Michigan. The car could be 'optioned out' so the customer could actually see all the color and trim combinations that are available. Then, with CRTs located at the dealership, the customer could order the car by directly accessing the assembly plant's computers. By combining high-tech marketing and manufacturing, Cole says, consumers will be provided with greater choices and faster deliveries, plus be certain that what they get is what they saw.

INSIDE JAPAN'S AUTO INDUSTRY

AI's Detroit editor, John McElroy, recently toured various automotive facilities in Japan. Here is the first report on his observations of the Japanese auto industry.

by John McElroy

Nobody looks forward to a 20 hour plane trip to Tokyo, but I was glad the trip was finally under way. It had taken 3 months to select the sites, make all the arrangements and to get the budget approved. And as I settled into the cramped seat in the back of the 747, I heaved a sigh of relief. All the planning that could be done, had been done. Now it was time to get on with it.

Two faces of Japan — The bustling congestion of a street scene in Tokyo's Ginza district contrasts sharply with the serene grandeur of Nagoya Castle.

WHAT IF?

If the voluntary import restrictions expire next April, Japanese automakers are ready to step in with the right products at the right price.

by John McElroy

The moment you step out of Narita airport to catch a bus to Tokyo it hits you . . . They're everywhere. Between the taxis, the buses and the cars that people are driving up to the terminal, you can practically see every type of passenger vehicle that is built in Japan.

And what variety! Big cars, small cars, econoboxes, limousines, vans, trucks and buses. Diesels, turbos, twin cams and turbocharged twin cams. Notchbacks, hatchbacks, sedans and two-seaters. Not to mention the ubiquitous buzzing motor-scooters. And all of them are

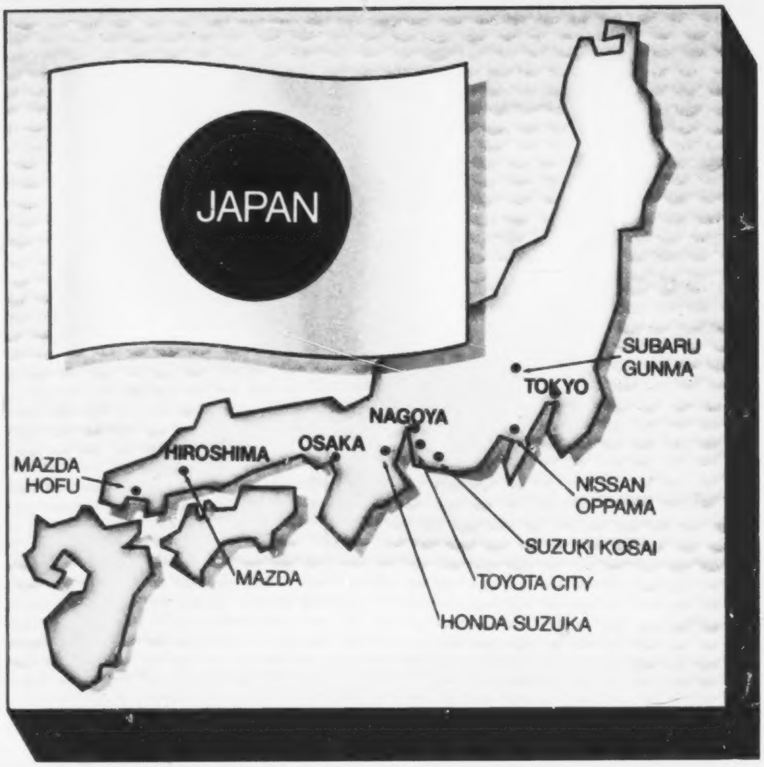
Nissan's hot Skyline RS and (inset) Mazda's luxurious Luce are two examples of the breadth of Japanese products not available here.

INSIDE JAPAN

For quite some time I'd been anxious to get to Japan. I like to travel, but the real purpose of this trip was something more of an intelligence-gathering mission. Not that there was anything secret or sinister about it—quite the opposite. The idea was to cram as many plant tours and interviews as possible into 2 weeks and make this information available to you, our readers.

Sure, every American car company, all the auto analysts and plenty of suppliers have sent delegations over to tour the Japanese auto facilities. There have even been books written about it. But a lot of people haven't gone and maybe you're one of them.

So what makes this story any different from the rest of them? Hopefully it will provide you with the objective observations of a journalist. Better



AI's tour of Japan included these plants located in different areas around the country.

WHAT IF?

surging and ebbing, speeding and slowing as they make their way up the left hand side of the road through some of the thickest traffic in the world.

What the first time visitor can't help but notice is that the Japanese automakers build cars that fit into virtually every single market segment—everything from 550 cm³ runabouts to rear-wheel-drive, V8 powered, body-on-frame limousines. Most Americans are unaware of the rich product variety the Japanese produce because the country only exports about one-third of the models it produces. But if the Voluntary Restraint Agreement (VRA) expires next April, that could all change.

Primed And Ready To Go

At this point no one knows whether the VRA will be allowed to lapse. But one thing is certain. It will be a political decision. We already know what it's like to live with import restrictions, so let's assume for the moment that they come off next year, and let's analyze the possibilities that could unfold.

First, there could be a virtual *tsunami* of Japanese cars flooding the market. Estimates within the US auto industry predict the Japanese could sell another million units on top of the 1.85 million units currently covered by the VRA. Some predict the Japanese could take 30% of the market, with total imports taking 40%. One thing is certain—the Japanese automakers have the capacity in place to sell a lot more cars here.

Another possibility is that the VRA could be extended, with each Japanese automaker given a greater number of cars it could bring in.

And then it's possible (maybe even likely) that the VRA will be allowed to lapse, but that some branch of the Japanese government, such as MITI, will step in to regulate the flow of cars to something like a 10% increase per year.

But whatever scenario develops, you can be sure the Japanese automakers will be able to bring in a greater variety of products. By establishing assembly operations in the US they will be able to bring in other products even if the VRA continues beyond 1985.

A Car For Every Purse & Purpose

And their products are priced right. Not only do the Japanese automakers enjoy tax and currency advantages, their overall productivity provides them with a cost advantage well over $2000 per car.

In their home market, the Japanese automakers are into virtually every market segment that exists. So they have plenty of models to fit into new market niches if they get the opportunity to export them. Although the great majority of these cars are clustered in the sub-compact area, they have products that range all the way to the very upper end of the market.

One area that they are particularly interested in establishing in the US is the mini-car market. With 1.0-L engines that yield very high fuel economy and prices that start under $5000, these make ideal cars for the first time buyer, or even second cars for multi-car families.

Honda, Subaru, Nissan, Suzuki and Toyota (via Daihatsu) all have entries in this market segment. And they're not buzzy little tin can cars. They're very good products. The latest entry in this segment, the Subaru Justy, of-still, perhaps these stories will be able to bring alive the flavor and essence of the people and places that comprise the Japanese auto industry—something a technical report would never do.

East/West Comparisons

Another major difference will be relating what I saw in Japan to what I've seen in the US. For the last year I've toured many automotive factories around the American Midwest to establish a baseline for comparison with facilities in Japan. And I talked to many American executives to determine what they look for when they take plant tours and how they measure the efficiency of an operation.

My American tours included visits to the oldest and the newest plants, ones that make big cars and small cars, ones that make engines or transmissions, and even a look at stamping operations. I tried to take in the latest American technology such as GM's Lake Orion and Chrysler's Windsor Assembly plants, and other places where productivity has been increased with better management techniques instead of technology, such as Ford's Wayne Assembly plant.

To get a handle on future operations I interviewed the people who are putting Buick City and the Saturn Project together. To find out what the domestic automakers are doing about their employee relations, I talked to people involved with GM's QWL (Quality Of Work Life) and Ford's EI (Employee Involvement) programs, and to some of the top people in the UAW. The idea is to provide you with information that will not only let you see how your operations stack up against the Japanese, but how your competition does too.

Tedious Logistics

Unlike the American car companies, the Japanese automakers are a lot more careful about who they let

(Continued)

The best way to travel around Japan to visit the different auto plants is on the bullet train (Shinkansen) which cruises at 120 mph. Ironically, although Japan's trains are super efficient, none of the automakers uses trains to move inventory.

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fers 4WD and CVT (Continuously Variable Transmission) options. Honda's City Turbo II with intercooler will blow the doors off most sports cars.

The only cloud on the mini-cars' horizon is how they will fare with US safety standards.

Specialty Segment Hot

Another hot market segment in Japan are personal specialty cars. These tend to be sporty versions of high volume models, but with significantly different sheet metal and more powerful engines. Size-wise, the personal specialty cars tend to be in the subcompact segment, but they also stretch beyond the compact segment into the intermediate segment.

Going the other way altogether, Toyota has a mid-engine, two-seat sports car code-named SV3 that may well have been introduced in Japan by the time you read this.

Of course, the big question for the American (and European) automakers is what plans the Japanese have for the full-size and luxury market. For the most part, the Japanese don't have many cars in these segments, but it's an area they're watching very closely. Mazda, for example, has recently redesigned the 929 (Cosmo), and in styling and execution it's not unlike a Volvo 760. And Honda has everyone guessing if its XX car, the one it will develop and build jointly with Rover, will place it head-to-head with Mercedes-Benz.

At the very top end of the market both Toyota and Nissan build rear-wheel-drive, V8 powered limousines in very small volume for fat cats and diplomats. Although they are 1960s vintage designs, all it would take is for either company to get really serious about competing in this market segment before they would have products that could challenge GM's and Ford's big cars.

Performance Big In Japan

Not only do the Japanese have a

(Continued)

Output Per Employee

(Vehicles Per Year)

Manufacturer	1977	1978	1979	1980	1981	1982	1983
General Motors	12.0	12.0	11.3	10.3	9.8	10.0	11.7
Ford	14.6	13.7	13.1	11.5	11.9	12.5	14.3
Chrysler	13.7	13.0	12.0	11.0	14.0	14.2	16.4
Toyota	59.0	62.0	63.0	69.0	66.7	61.0	58.0*
Nissan	NA	43.0	47.5	49.5	49.4	48.0	44.0
Mazda	28.0	33.0	37.0	42.8	45.5	43.4	NA
Honda	--	--	--	--	--	44.0	43.0
Subaru	--	--	--	--	--	--	46.5
Suzuki	--	--	--	--	--	--	72.8

Source: Automotive Industries magazine

*includes Toyota Motor Sales personnel, otherwise would be 64.0.

Though the US automakers have increased their productivity in the last few years, the Japanese automakers are still more efficient. And they have been able to translate this efficiency into a $2,000 cost advantage.

INSIDE JAPAN

into their plants and what they'll let them see. Initially, I tried to set up this trip going through the Japan Automobile Manufacturers Assoc. (JAMA), figuring it would be easier to go through one source. At first they consented, but then backed off. Before any Japanese car company would agree to let me in, they wanted to know exactly which plants I wanted to tour and a list of the questions I wanted to ask.

What ensued was a flurry of letters, phone calls and telegrams between my office in the Fisher Building in Detroit and the Japanese automaker's offices in the US and Japan. It took several months to nail down the dates and places that I would visit. But planning out every last detail later proved to be very beneficial. Since I was traveling by myself and I don't speak a lick of Japanese it was important to lay out all the groundwork in advance. As a result, the whole trip went off without a hitch.

What I saw really opened my eyes. It's one thing to read about how the Japanese operate, but it's quite another thing to see it for yourself. It convinced me that the secret of Japanese efficiency is no secret at all.

For one thing, they don't do it with high technology or greater numbers of robots. My American plant tours showed me that the US automakers actually have newer and more sophisticated technology than the Japanese. What the Japanese taught me is that you can't measure an operation by the sophistication of its technology. Instead, you have to measure its overall efficiency.

In fact, the most astonishing revelation of all was to see what is probably the world's most efficient engine plant operating with 20-year-old American equipment.

The Most Efficient Operations

I'll save the details for later, but let me say that I probably saw the world's most efficient assembly plant and also the fastest assembly line. I saw die changes in 5 minutes in new plants, and 30 minutes in plants that also used old American presses.

The Japanese showed me how they operate at bare minimum inventory levels with just-in-time production. They showed me machining operations where rejects average only 0.5%! What I saw was an almost fanatical devotion to quality. All the employees pitch in and constantly improve their processes.

Most importantly, what I saw was a host of techniques and processes that could be copied here in the US with virtually no capital investment.

The main thing I learned is that you can't buy Japanese productivity. I doubt very much that the American auto industry is going to be able to solve its problems by spending money on new technology. Nor can this industry continue to pin its problems on an undervalued yen or commodity tax rebates. These are genuine con-

WHAT IF?

host of different products to cover the market spectrum, they have an incredible amount of parts and components to provide their customers with the convenience and efficiency they want.

Performance is a hot item in Japan these days and there is an incredible variety of powertrains to suit a multitude of different tastes. Although Nissan recently developed a V6 and Honda is working on one for the XX car, larger engines are taxed heavily in Japan. So, the most popular power-boosting option is the turbocharger. Several models are available with intercoolers as well. In fact, over 8% of all Japanese cars sold last year were fitted with turbos.

But the turbo is not limited to expensive performance models. It's even available in the 550 cm³ runabouts made by Mitsubishi, Daihatsu and Suzuki.

Those who don't find turbos to their taste can select from a number of twin cam engines. Like turbos, these engines are very popular and were installed in 7% of all cars sold in Japan last year. They are available in a variety of different displacements, including a 1.6-L version, complete with a variable induction system, that Toyota installs in the Corolla and Sprinter. And if you spell your performance with a capital P, both Toyota and Nissan have turbocharged twin cam engines available.

Small Car Safety—A Can Of Worms?

When you open that can labeled automotive safety facts, beware of worms. "In a 2000 lb car, overall, your risk of being killed [if you are in an accident] is around twice as much as in a 4000 lb car," says David Martin, GM's director of automotive safety on the Environmental Activities staff. But then you're significantly *less likely to be in an accident* in a small car than in a large car.

While drivers of small cars are generally younger than drivers of large cars, "young drivers in small cars are less involved in accidents than young drivers in large cars," Martin says. Why? "I think there's a tendency for people to recognize they're more at risk. There's less sound deadening, the ride is less boulevard, so your perception of speed is greater," he says.

"Then too, seat belt usage in smaller cars is greater. Overall in the US about 14% wear seat belts. In small cars it's 20%; while in some big cars it's down around 10% or less. The following distance in a smaller car is greater, too," he says.

"Put it in perspective and consider life expectancy effects," Martin says. "If as a youngster you decide you're going to always use larger cars, you'll add about 2½ months to your life.

"If you decide at the same age to always wear seatbelts," no matter the size of the car, "you'll add about the same to your life expectancy."

"If at the same age you decide you're never going to let your weight get 20% above normal, you'll add 2½ *years* to your life. If you avoid cigarette smoking, you'll add 6½ *years*," says Martin. ■ *—Douglas Williams*

Electronics Everywhere

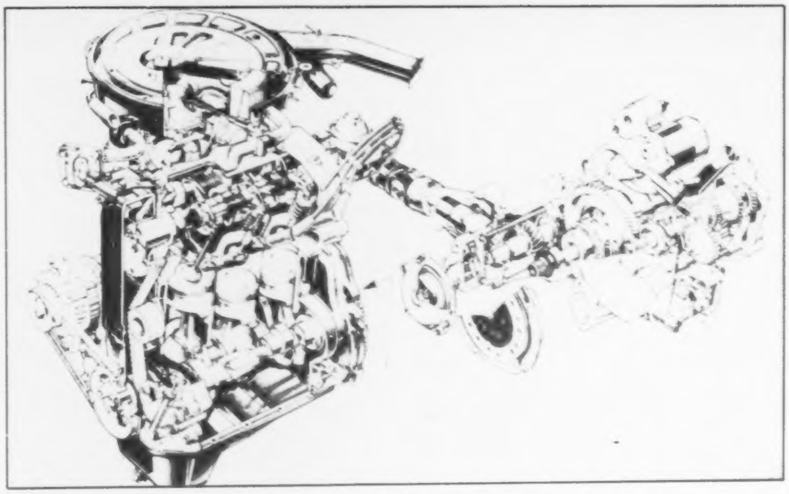
Transmissions, like so many other components, are being fitted with electronic controls. Nissan has had an cerns, to be sure. But far better the US industry spend its efforts fixing those things it can directly control, starting with its basic manufacturing operations.

Free R&D For You

Viewed in business terms this trip really represents an investment in research and development by *Automotive Industries.* We're going to make this R&D available to you in a series of stories over the coming months that will cover assembly, stamping, engine and transmission operations, quality systems, just-in-time systems and employee relations.

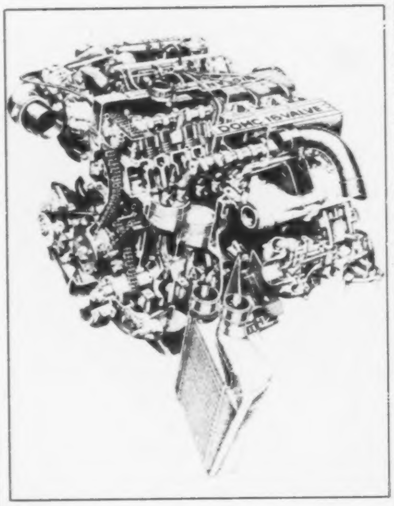
We hope you will find some piece of information or some tidbit that you'll be able to put to work in your own operations. Most of this information won't be of a technical nature. After all, I'm a journalist, not a manufacturing expert.

But anyone who survived the 1979-1982 automotive disaster knows the stakes are too high to let that happen again.



An example of the technical innovations being introduced in Japan is the powertrain of Subaru's *transverse* engine, *four-wheel-drive Justy.*

Let me just pass this along. After several of my Japanese plant tours, my hosts sat me down and asked me how I thought they could improve their operations. And they weren't just being polite. They had their notebooks out and were scribbling down what I said. What this showed me is that the Japanese are willing to learn from anyone, even an American journalist. ■



The hottest engines in Japan, like this one from Nissan's Skyline RS, use four valves per cylinder, double overhead cams, fuel injection, turbocharging and intercooling.

electronically controlled four-speed automatic for rear-wheel-drive (rwd) cars on the market for about a year now. And Toyota recently introduced an electronically controlled four-speed transaxle for the rwd Corolla. As if that isn't enough, Isuzu is developing a five-speed automatic, and Mitsubishi's electronically-controlled transmission allows the driver to select from three different shift modes.

Adjustable operating parameters seem to be a trend that has carried over into suspensions. Nissan, Toyota, Mitsubishi and Mazda all have adjustable suspensions available on certain car lines. Nissan's Bluebird, for one, even has adjustable power steering.

Electronics is the technical arena where the Japanese are proving to be truly creative. A complete list of electronic components would be too lengthy to document here, but it's fascinating to touch on some of the more far-out ideas that are available in the market today:

- Nissan's Safety Drive Adviser monitors the driver's normal steering habits for the first 10 minutes of driving. If it detects a deviation from this style due to drowsiness, it beeps and flashes a warning light.
- Nissan has also developed rain-sensitive windshield wipers that activate when it's raining, and adjust the intermittent sweep according to the intensity of the rain.
- Toyota has developed a sonar back-up warning device that lets the driver know if someone or something is behind the car. The closer the car gets to the object as it backs up, the louder the warning beep.
- At least three Japanese automakers sell navigation systems in certain cars.
- Perhaps the epitome of electronic self-indulgence is the rear seat vibrator that is available on the Mitsubishi Sigma Royal.

Profits Poured Into Product

Although many items the Japanese have developed are gimmicky and sometimes seem to have been developed more for their novelty rather than any real benefit to the customer (such as talking dashboards), it shows that the Japanese are the innovators today. But the real message here for the American automakers is that it shows the Japanese are pouring their profits back into their product line. ■

(Continued)

WHAT IF?

Japanese Cars Not Sold In The American Market

MANUFACTURER	2-SEATERS	MINI	SUB-COMPACT	COMPACT	INTERMEDIATE	LUXURY	4X4
Toyota	SV-3	Starlet	Corolla Carina Corona Sprinter Corsa	Vista	Crown Chaser Cresta Soarer	Century	
Nissan		March (Micra)	Pulsar Sunny Langly Prairie Liberta Villa Laurel Spirit Auster Bluebird Silvia/Gazelle	Leopard Skyline	Laurel Cedric/Gloria	President	Safari
Mazda				Luce Cosmo			
Mitsubishi		Minica	Mirage II Lancer Lancer Fiore Galant Galant Lambda		Debonair		Jeep K-J44
Honda		City	Ballade Vigor Quint				
Isuzu			Florian Aska				
Subaru		Rex Justy					
Suzuki		Fronte Cervo Alto					SJ410
Daihatsu (Toyota Group Company)		Cuore Charade	Charmant				Taft

Some cars listed here may be familiar to you and others may not. Some have certain models that are sold in the US and some represent the same cars that are marketed through different dealers under different names. Though not all of these cars would be exported to the US, it shows that the Japanese automakers cover virtually every market segment.

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US MEDIUM TRUCKS

Dieselization: Is The Medium The Real Message?

The dieselization of medium trucks continues even as the future effectiveness of those trucks in the US is questioned. Is the end in sight for gas-powered mediums? All the coming imports are diesel. . .and IH makes it official—no more medium-duty gas engines

by Douglas Williams

Cummins and Onan are two large and important firms that, with all due respect, your average UPS delivery man or bread truck driver has probably never heard of.

But both Cummins and Onan are making major moves at those and most other medium truck drivers. That fact tells about as much as anything about the impending turmoil and change facing the medium truck world and the diesel business within it.

Onan is well known internationally as a manufacturer of generator sets, plus the diesels used in some of them. Until now though, the company has never made an engine for vehicles. Today if you've got a truck on the high end of light-duty or low end of medium-duty, Onan wants to talk to you.

Cummins, of course, makes very large diesel engines and is the dominant manufacturer of diesel engines for Class 8 trucks—the biggest over-the-road vehicles. It now commands something like 60% of that market, far and away ahead of Caterpillar and Detroit Diesel Allison.

Until now Cummins has survived and thrived without much attention to medium-duty diesels. But no longer. The company now has three separate new engines aimed specifically at medium trucks, and it's coming on strong.

In Class 6, Ford sells its littlest big truck, the F600.

Gas Power Gone?

Until about 15 years ago, medium trucks in the US were gasoline powered. Now International Harvester says it will end its gasoline engine production for medium trucks on December 1st. That will leave only Ford and General Motors as manufacturers of gasoline engines for medium trucks.

In the rest of the world, trucks of all sizes are virtually all diesel powered. All of the importers, from Iveco, Mercedes and Volvo to Hino and Isuzu are dedicated exclusively to diesel engines.

Apart from engines, the whole medium truck picture is, at best, mixed.

Greg Pritz, product planning manager for small engines at Cummins, has one key question, "Will the polarization out of the middle range continue?"

In the US, largely because of tax laws and regulatory decisions, there has been a desertion of truck manufacturing in the 10,000 to 16,000 lb (*4536 to 7258 kg*) GVW range. The market, and manufacturers supplying it, have pushed down toward the lighter vehicles and up toward the heavier to the point that vast numbers are manufactured below 10,000 lb and substantial numbers above 19,500 lb (*8855 kg*), but almost nothing in between.

(Continued)

Medium Truck Diesels

In Class 3 is Ford's biggest little truck, the F350. Wither the Class 4s and 5s?

Deregulation and a complete reshuffle of trucks and trucking taxation in the Surface Transportation Assistance Act of 1982 has brought about the change.

Cummins Sees Future Downturn

Now Pritz says that Cummins' numbers show the medium truck business for 1983 "trending down to about 93,000. In 1982 it was 98,000. It used to be 300,000-400,000," he adds. "We were calling for 1983 to be 110,000," Pritz says.

(Cummins defines, for its own use, medium trucks as trucks heavier than light-duty but still not the serious heavy-duty, over-the-road long distance haulers. This means they include trucks that are technically considered Class 8, or over 33,000 lb [*14,968 kg*] GVW, but in terms of desirable powerplant are medium-duty.)

Cummins estimates that 56½% of those medium trucks had diesel engines in 1983, compared to 52% in 1982. It uses a self-defined estimate of the "economically justified dieselization rate," to define where the market is going.

Diesel engines cost more than gasoline engines, of course. "But," says Pritz, "if you figure in the diesel premium today, probably two-thirds of the market would be justified if people really put the pencil to the paper and evaluated. We figure in the mid-range market people are just a little more initial-price oriented."

Ford Mothballs The F500

Over at Ford, heavy truck marketing manager Jeffrey Kahn makes note of the fact that the company's F500 series medium truck has simply gone by the boards in recent years. The biggest light truck Ford makes is the F350; the smallest heavy is the F600.

Asked specifically if Ford is looking to fill the gap between Class 3 and Class 6 trucks (10,000 to 19,500 lb GVW), Kahn

'New' Players In The Game

Onan is aiming an inline diesel six at the medium truck world. It displaces 3.4 L (*210 in.*^{3}) and puts out 120 hp @ 3600 rpm. Called the model L634T-A, it is turbocharged but not aftercooled (Onan's "A" designation means automotive), and has already received EPA certification.

The engine is from Onan's L-series, which started in production at Huntsville, AL in mid-1981. Merchandising manager John Patrek says, "It's beyond market seeding now; we're looking for serious applications."

The three Cummins engines newly aimed at medium trucks are the 4B and 6B, respectively 3.9 L inline four and 5.9 L inline six (*239 and 359 in.*^{3}). The turbo six is being introduced now, rated at 160 hp @ 2500 rpm, for Class 5 and 7 trucks. "Six months later we'll add aftercooling, which will boost the horsepower up to 180," says John Garvey, Cummins' automotive production manager for small engines.

In September, the 4B will be introduced at 105 hp for Class 3 and 4 trucks. It will be followed in six months by an aftercooled version.

The 6C Cummins will debut in August 1985, aimed at the low end of the Class 7 "and into the Class 8 market," Garvey says. It's the biggest of the engines Cummins will be getting from its Rocky Mount, NC joint venture with JI Case. It'll be introduced as a 210 hp turbocharged engine and six months later aftercooled which will rase its output to 235 hp.

The Cummins 6C will displace 8.3 L (*505 in.*^{3}).

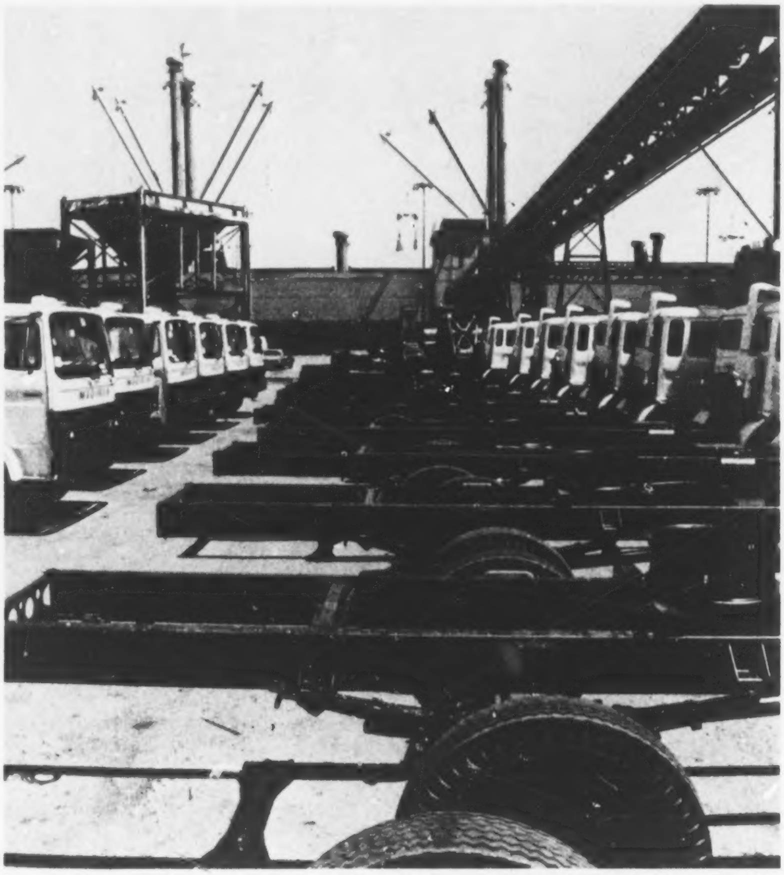
The B and C engines will thus give Cummins new medium truck engine coverage of 105-235 hp. ■

Factory Truck Sales

19,501-33,000 lb. (Class 5, 6 & 7)

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Units Sold*	224.4	165.5	159.8	175.1	187.7	179.0	118.0	111.5	80.8	81.9
% Diesel Power	5.6%	7.6%	8.8%	15.3%	18.6%	20.9%	36.6%	41.8%	43.1%	47.8%

** in thousands* *Source: Motor Vehicle Manufacturers Assoc.*



The medium truck sector grows in entries even as the market diminishes. Foreign competitors, such as Iveco, are capitalizing on their diesel-only mediums.

says, "We have done a number of studies and found the volume is so small, roughly 10,000 non-recreational vehicles, as to not justify product actions. But we are keeping an eye on it," he adds.

"You're going to be seeing some new entries from overseas, and you'll see us start to meet those new entries," Kahn says. "We won't abandon that market. We'll find a filler for Class 4 and 5," he adds.

And will that filler be a diesel truck? "It's very dependent on the price of diesel fuel and the price of the engine," Kahn says. The diesel premium, compared to a gas engine, represents a 20-30% addition to the price of a medium truck, he argues. "There will be a requirement or need for gasoline engines as long as the price of fuel stays reasonably low. The higher fuel prices go in general, the more attractive diesel gets," says Ford's Kahn.

Leon Mellen, manager of medium and heavy truck planning at General Motors' truck operations, says, "I think there will be continued growth of dieselization with the potential for some spurts now and then." Those spurts, he adds, will probably result from external changes in the business—like restrictions in emissions limits.

"If it's growing at the rate of 2-3% a year it might grow 4 or 5% in 1985," he says, when gasoline emissions limits are tightened. Diesel growth might slow "to 1 or 2% in 1988" when diesel emissions are expected to get screwed down.

GM: 40% Gas Forever?

"You get out another 8 or 10 years or 15 or 30 and it might stabilize at 20 or 40% gas forever," Mellen says.

Tom Carpenter, administrator of medium and heavy truck marketing at GM says, "Those are the problems we wrestle with all the time. So much of it [the market] is driven by the price of gas or diesel fuel or taxes."

GM, of course, is bringing an Isuzu medium low cab forward into the US badged both by GMC and Chevrolet. "That's a segment some are saying will probably double in the next couple of years," Carpenter says.

There's one single problem with it, though—"You're more than doubling the number of competitors in it," says Mellen.

So finally, where are diesels going in medium trucks in the US?

Ford's Kahn offers a lot of pluses to the long-term survival of gasoline power in those vehicles. "The gasoline product is a familiar product for service people. It's cheap to repair; the repair knowledge is there. Gas engines today are very durable.

"We have a lot of gasoline engine expertise and we're not going to go out of the gasoline engine business unless there's no market left. As long as there's a market for gasoline engines, we'll be there," Kahn says.

Cummins' John R. Garvey, automotive product manager for small engines, says he thinks the move to diesels in medium trucks "is just starting. Our feeling is, people are just starting to realize the benefits of diesels. When you go from 6 mpg to the neighborhood of 12 or 15 mpg, that's a pretty easy sell. The tough part," Garvey says, "is that there's a lot of competition out there and every OEM has his own plant." ■

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WHITE COLLAR PROTEST
WHITE COLLAR PROTEST

White Collar Unrest

NON-UNION WORKERS CRY 'FOUL'

Inside Japan

How Work Practices Send Productivity Soaring

Advanced Machine Tools Keep Auto Plants Flexible

CHILTON'S
AUTOMOTIVE INDUSTRIES

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COVER

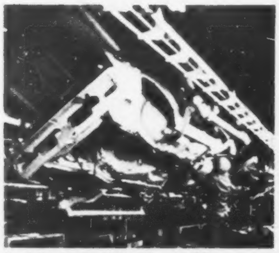
Non-union workers are raising cane in some surprising places. (Thanks to AVM Services in Bridgeport, PA for photo location.)

NEXT MONTH

Nailing down production schedules, plus an analysis of metals and plastics materials substitutions come your way in September.

QUOTABLE

"There was a time when an extensive use of aluminum for automobile components would hardly be cause for comment. The 1903 Packard and the 1903 Franklin used considerable amounts of aluminum. That was the year the Wright brothers flew at Kitty Hawk in an aircraft powered by a cast aluminum engine. Even Ford's Model T, in its prime, used aluminum in applications like the transmission housing and the hood."—Reynolds Metals chief William O. Bourke, speaking on everything new being old, at a recent International Motor Press Assoc. gathering.



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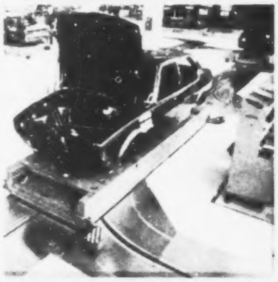

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ONE OF THE ABC PUBLISHING COMPANIES

How To Make Record Profits

by Joseph M. Callahan, Editor

The record or near-record profits reported by GM, Ford and Chrysler, which were amassed even though vehicle sales were not that robust, are proof of the best kind that the American auto industry is quietly revolutionizing its manufacturing system.

None of us mere mortals who don't receive bonuses have much sympathy for the 8736 individuals in the auto industry who did . . . and got criticized for their efforts. But if these managers ever earned bonuses, they did last year.

What's especially significant about the revolutionary new management and production techniques that produced these profits is that, in most cases, these techniques aren't fully implemented yet. So the benefits undoubtedly will be greater in the future than they were last year.

A possibility, and Chrysler officials have discussed this with the press, is that these new management procedures might be honed to such a fine point that the auto companies will be able to remain profitable even in the next, inevitable auto sales slump.

The whole business structure in this country may also benefit from this revolution. The auto companies, in attempting to improve the productivity and parts quality of their suppliers, have been eagerly conducting seminars to educate suppliers about these new techniques. Some industrial cross fertilization surely is at work.

These seminars are already having some sort of a nationwide impact because more and more auto suppliers have become larger, diversified companies, with their auto-supply business often representing only 15-30% of their business. As a result, lessons learned in the auto industry are being transmitted almost directly into many other industries.

The most significant of these "new" management techniques is probably the Just-In-Time (JIT) system. Originally, it was viewed as merely a system for reducing inventories. But it was soon learned that JIT must be a part of a whole new approach to management in which there is an almost continuous flow of materials, parts, components and eventually vehicles through the plant, with no interruption in the process and no inventory stack-ups.

A recent Ford Motor Co. white paper described the trend quite neatly, saying, "Making it [JIT] work involves changing the entire manufacturing process to improve productivity, the use of human resources and, most importantly, quality.

"Just-In-Time replaces the traditional 'just-in-case' method aimed at assuring uninterrupted production by maintaining huge inventories of parts and components at supplier plants, in trucks or rail cars between plants, and between processes at the plants. With just-in-case, the practice was to use excess inventory to keep the line moving in spite of equipment breakdowns, shipment delays, defective parts or other disruptions. As a result there was little incentive to get to the root causes of production concerns."

Of course, JIT can't work in a plant unless high quality parts are flowing through the system. Otherwise, there would be a production line shut down every 15 minutes. Slowly, the quality of parts and the finished cars is being raised in the industry, although the battle for top quality hasn't yet been won by a long shot.

Statistical Process Control (SPC), so fervently advocated by Dr. W. Edwards Deming and his peers and now being adopted by many automakers and suppliers, deserves major credit for the quality improvement as well as for much of the progress made thus far in adopting JIT.

SPC not only improves the quality, but is also improves productivity and profitability by making less scrap, by reducing the rework and the facilities rework required, by lowering warranty costs and, very importantly, by producing a better image of the finished product's quality among customers.

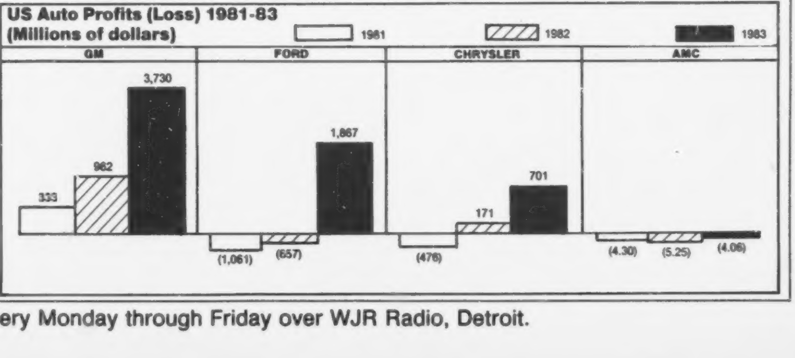
One of the most dramatic proofs of the importance of JIT is that GM recently re-processed its Detroit-Hamtramck (Poletown) Assembly Plant and found that it could produce the same number of cars in two million square feet that if formerly expected to build in three million square feet. This valuable space will now be used for retraining employees and testing advanced manufacturing machines.

Naturally, a dozen or more other new management, purchasing and manufacturing procedures have contributed to this outstanding profit picture and will contribute even more in the coming years.

Among these relatively new initiatives are the national and some local UAW contracts which eliminate inefficient work practices, the revolutionary new purchasing procedures (which also squeeze suppliers), the slight trend to buy more parts from the southern states and overseas, barcoding which provides vastly more efficient control of parts in the plants and the increased use of robots and other productivity-improving machines.

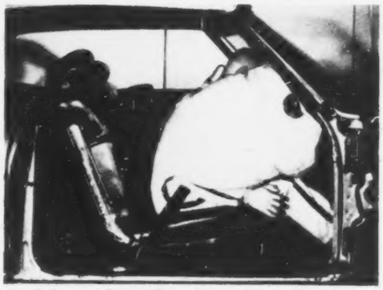
Less important contributors to the cost reduction are the slightly reduced medical and dental costs, the promising move toward assembly-plant schedule stability, the coming reorganization at General Motors and possibly most importantly, the motivation that has stimulated most salaried and hourly people to work a lot harder.

None of this would have mattered, however, without the meaningful upward thrust in sales. ■


US Auto Profits (Loss) 1981-83
(Millions of dollars)

All Parties Retrench As Gov't Sets Restraint Standard

by Neil M. Szigethy



Dole's air bag decision: 'Costly, complicated and cumbersome'?

"Of all the special interests concerned, I can consider only one—the public interest." With these words, Secretary of Transportation Elizabeth Dole announced the long awaited (but doubtful the last) government ruling on passive restraints. Mandating a gradual phase-in of passive restraints on cars beginning September 1, 1986 and culminating in 100% compliance by September 1, 1989, Dole said, "The plan . . . will save as many lives as possible, as soon as possible."

The 100% compliance rule will be rescinded if states representing two-thirds of the US population pass mandatory seatbelt usage laws by April 1, 1989. "The belts already in our cars have tremendous life-saving potential," Dole said. "State-use laws would realize that potential."

The rule requires automatic, passive protection in accordance with Federal Motor Vehicle Safety Standard 208—basically protection of the driver and right, front seat passenger in a 30-mph (*48-km/hr*) crash. Either air bags, passive belts or even "friendly" interiors could be used to meet the standard, although the government did show a bias toward air bags.

To encourage the use of air bags, DOT will credit automakers with 1.5 cars complying during the phase-in period if the driver side requirement is met by means other than automatic belts.

Separately, a $40 million a year DOT and private sector (50/50) fund will be made available for educational programs encouraging the use of belts and of mandatory usage laws.

DOT estimated the cost of automatic belts at $40 more than present manual belts. It estimated air bag costs at $320 for a full-front bag with a 1 million production run.

Interestingly, a recent national survey by J.D. Power & Associates claims the US driving-age public favors mandatory belt usage laws over mandated air bags or other passive restraint systems. Thirty-nine percent chose mandatory belt usage, 27% chose air bags and 25% chose other passive restraints.

When asked to rate eight safety features in order of importance, extra front-end impact protection, conventional belts and four-wheel disc brakes were rated first. Air bags were rated least important.

Reaction to the Dole decision from US automakers was mixed. GM was "pleased," Ford "strongly endorses" it, but Chrysler "regrets the necessity" of the ruling. AMC would rather have seen a "demonstration project," and VWoA "intends to fully comply."

All said they wished state legislatures would mandate a seatbelt usage laws. All urged individual use.

Helen Petrauskas, Ford safety and environment VP, said nearly 140 million cars and trucks now have seatbelts at a cost of $14 billion, and that they would "start saving lives and preventing injuries immediately." Ford isn't sure it can meet the September 1986 deadline, she added.

Chrysler knocked the Dole decision as "costly, complicated and cumbersome," adding that the seatbelt is the "best safety device." Echoed AMC, belts are "the best safety device, bar none."

Reportedly, the insurance industry lobby has already filed suit against the decision, and no doubt Ralph Nader and other "consumer advocates" will follow. ■

Reported by Leo Abruzzese in Washington and Douglas Williams in Detroit.

Competition Hot In Europe

by Peter J. Mullins

Competition among automakers in Europe is a real dogfight at the moment, As each month's figures are announced, market leadership changes. In January, Fiat clawed its way back on top, but gave way to GM in February and then VW in March.

Renault, market leader though '83, has slipped to sixth place behind Fiat, Ford, GM, VW/Audi and Peugeot/Citroen/Talbot in the first three months of '84.

GM is the dark horse that has come strongly from behind in the last few years. In 1983, it increased its Euro market share from just over 9% to over 11% and expects to pull ahead of Ford this year. At the moment, both companies are running neck and neck with figures for the first three months showing Ford at 12.2% and GM at 12.1%.

In the UK, GM as done spectacularly well. It ended 1983 with a UK market share of 14.6% compared with only 8.5% two years before. The Vauxhall-Opel sales company in the UK expects to sell 300,000 cars this year—this will push its market share to 16%. (This was its original target, but it is one year ahead of schedule.)

Ford appears to be in a state of some disarray in Europe at the moment. James Capolongo quit as president recently, close on the heels of Ed Blanch, chairman of Ford Europe, who opted to take early retirement.

Since, FoMoCo's US executive VP of International, Robert Lutz, was appointed Ford Europe chairman, but at presstime the president's post was unfilled. Nevertheless, rumors are rife that Ford is looking around for other top talent, particularly in the direction of BL (as is Nissan).

The other company going through a bad patch in Europe is Renault. Although it brought in the R9 and then R11 as sales of the R5 tailed off—and indeed these have done relatively well—their introduction coincided with strongly increased competition, and the hiatus allowed Fiat and VW to make inroads into traditional French markets in Europe.

Pressure is so great now in Europe, with overcapacity, pressure from Japan, and increasing pressure from GM, that no indigenous carmaker can afford a momentary slip. It could be fatal! This is why we are seeing a con-

(Continued)

tinual see-sawing of fortunes among European car companies.

And as the second half of the '80s approaches, it's bound to get worse. GM pressure will increase in Europe. The US giant reckons it spent something like $2½ billion on plant and facilities in Europe in the four years up to 1982. And this is not just on plants like Zaragoza in Spain (which is said by GM to be one of the most modern and integrated plants in the world) but also on components and, increasingly, systems.

The Japanese producers are in no way going to relent the onslaught on Europe. Admittedly, they are contained in crucial markets like France, Italy and the UK, but they will continue to encroach in uncommitted countries like Switzerland and Belgium. The Nissan plant and others like it will add to over-capacity.

A big problem for European carmakers is the unrelenting need for big investments. It is estimated the two major French car producers, Renault and Peugeot, must raise a total of around $2.5 billion/year over the next few years to finance the investment in new models and production capacity just to remain competitive.

European Market Shares '83 vs. '82

	% Share Of Market* 1983	1982
Renault	12.9	14.7
Ford	12.6	12.4
Fiat	12.3	12.5
VW/Audi	11.7	11.8
PSA	11.5	12.4
GM	11.5	9.7
Japanese	9.8	8.7
BL	4.2	3.7
Mercedes	3.3	3.2
BMW	3.0	2.8
Volvo	2.2	2.0

**Total sales in '83: 10.5 million; in '82: 10 million*

Source: UEA Motor Industry Database

But both groups are financially weak. A report on the French motor industry just published concludes that both will require support from the French government. The report (issued by the French Economic and Social Council) paints an alarming picture of the French motor industry, the performance of which has deteriorated during the last few years. French carmakers sold half a million fewer cars in Europe last year than in '79 and need to shed 80,000 jobs by '88.

All these problems bode ill for the European motor industry in the late '80s. In the volume car sector it looks as though there will have to be some rationalization. ■

Dr. Taguchi—Japan's Secret Weapon

by John McElroy

Visitors to Japanese manufacturing operations are often puzzled by the lack of Statistical Process Control (SPC) charts on the factory floor. The reason? The Japanese have gone beyond SPC, and their secret weapon is something called Experimental Design. The man who popularized it,

(Continued on Page 20)

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DETROIT/ANALYSIS

White Collar Unrest

NON-UNION WORKERS CRY 'FOUL'

While most eyes focus on the upcoming UAW contract talks, unrest at Ford could signal another problem brewing within the lower white collar ranks of the Big Three.

by Lance A. Ealey

Item: Roger Kruger, an engineer in Ford's Vehicle Engineering Office, took the floor during the company's annual meeting and crisply explained to Ford chairman Philip Caldwell and assembled stockholders what he felt were the economic concerns of the people on Ford's General Salary Role (GSR).

Kruger pointed to the "inequality of sacrifice of the General Salary Role people and the lower management ranks versus the executives who got the huge bonuses in the past few years." (Ford has reportedly cut over 20,000 salaried workers from its automotive businesses since 1979.)

Item: Chrysler vice-chairman Gerald Greenwald recently indicated the company has chopped its salaried staff just about in half, from 40,000 in 1978 to 21,000 in 1982. "And we're keeping that level despite the fact that we've recalled more than 25,000 blue collar workers in the last 2 years," Greenwald said.

Item: Top GM executives deny the company's awe-inspiring corporate reconfiguration is a structured attempt to reduce white-collar manpower. "A reduction in headcount is not one of GM's objectives," says Body and Assembly Group VP Charles Katko. Nevertheless, estimates of white collar reductions over the next few years resulting from the reshuffle run as high as 10%.

WHITE COLLAR
PROTEST

Mourning the casualties of an industry's rebirth in efficiency and productivity is not the way to gain American parity in the world auto industry. But "the seas of empty desks," to use the words of an *AI* staffer in describing visits to carmaker and supplier office buildings, tell a story all by themselves. . . . As do the harried and at times exasperated salaried employees who remain.

Goodbye 'Golden Handcuffs'

In bygone days, when a white collar worker gained employment at the Big Three, he or she gratefully donned what many have called 'golden handcuffs'—they may have hated their jobs, but the pay level, stock options and bonuses (which could equal half an employee's yearly salary) were so generous the nine-to-five grind was anything but unrewarding.

(Continued)

Changes In White Collar Benefits At Big Four Automakers Vary

Benefit	General Motors	Ford	Chrysler	American Motors
Basic Medical	Full Coverage	Deductible: $250 per individual, $750 per family	Full Coverage	Full Coverage (minor changes)
Savings & Stock Investment Plan	Co. Matches 35% of Employees 10%	Co. Matches 50% of Employees 5%	Employees Stock Ownership Plan	none
Cost Of Living Allowance	Continued With No Interruption	Stopped And Revived With Full Pay Back	Stopped in '81 Revived in '83	Discontinued
Vacation† (after 20 years)	5 Weeks	5 weeks	5 weeks	6 weeks
Annual Improvement Factor‡	Discontinued	Discontinued	Dropped, But Resumed in '84	Discontinued
Life Insurance	2 Times Annual Salary	2 Times Annual Salary	1½ Times Annual Salary	2 Times Annual Salary
Number On Bonus Role	5808	1500	1436	N.A.

† Does not include Christmas holidays or other holidays

‡ Was 3%

The Big Three took care of their own, and to a lesser extent, in many cases today they still do.

(It's something of an unwritten law that white collar workers benefit from blue collar contract negotiations in the auto companies. While white collars don't get overtime or some cost of living increases won by the union, they usually do receive many of the fringe benefits the blue collar workers win. Thus many white collar workers have traditionally had vested interests in how well the blue collar workers do at the bargaining table.)

(The UAW's reaction to this white collar benefits osmosis is downbeat: Former UAW president Douglas Fraser was quoted on one occasion as urging the companies to lay off more white collar people so they could keep his UAW members employed.)

The 'golden handcuffs' began to tarnish when the bottom dropped out of the auto market in 1980-81. The auto companies, notably Chrysler, began lopping off white collar ranks in an attempt to navigate what Chrysler chairman Lee Iacocca has called the 'Red Sea' of industry losses.

Paunch Around The Middle

That the auto industry, and in fact, most US businesses, had developed quite a paunch in middle management and salaried staffs prior to the last recession is best illustrated by the numbers of salaried personnel that have been let go without seriously compromising day-to-day operations at the companies. (Many support personnel—receptionists, secretaries, etc.—have been done away with. On making interview calls at the outland offices of Ford, Chrysler and other carmakers, *AI* reporters find more and more self-service reception areas. The visitor dials the person he wants to see from an unattended phone, and said person comes down and lets him in.)

And whittling away at salaried staffs is apparently a trend that will continue—one Ford executive went so far as to say that in the coming years the company's design, engineering and product planning staffs will be very substantially reduced because the company is committed to doing more and more of this work overseas. An example of this trend is that both the GM and Ford continuously variable transmissions (CVTs) are being developed and tested in Europe and Japan.

The trend toward thinning lower grade white collar ranks is not unique to the auto industry, as Robert Lamalie, president of Lamalie Associates, an executive search firm, indicated earlier this year.

"Most companies are investing in top management talent to capitalize on the recovery and retain a competitive edge," he said. "At the same time, they are making a determined effort to stay lean at the middle-management level even though some of the earnings pressure is off. We are definitely seeing a real dichotomy develop with respect to the middle manager and senior executive."

How Deep The Discontent?

No doubt this leaning of the middle white collar ranks is cause for unrest. But just how deeply concerned should the Big Three be about the levels of discontent brewing among their white collar workers? With Ford and GM's UAW contracts up for renegotiation this September, white collar unrest doesn't top the priority list at most companies right now (see May '84, "Strike Survey: Conflict Or Cooperation?" p. 24).

Still, there's a muted but rising protest coming from the offices of the industry's 218,000 salaried employees, many of whom are bothered by their failure to cash in on the auto companies' record profits, despite their increased work loads and the apparent promise of a continued shrinkage of their numbers.

In the push to become competitive on a global basis, the auto companies have begun extracting greater productivity from their non-union, nonbonus employees, as well as from their hourly workers. It has resulted in holding the salaries of most white collar workers at a constant level, while reducing fringe benefits at some companies.

As noted, automotive salaries and fringes are far ahead of those paid to salaried employees in most industries in this country. But that's small solace to the automotive people and their families—particularly at Ford—who see their companies making record profits and their top executives getting record bonuses.

One senior personnel executive at a major automotive company admits there is discontent, but doesn't term it anything like revolt level. Asked for specifics, he razzes engineers. "Engineers are prima donnas," he says. "They're always unhappy about something."

This view is echoed by a sales engineer who's spent a lot of time selling to GM, Ford and Chrysler in recent years. "Sure they're discontent, just like they always are," he says of the automotive engineering ranks.

"They've got to work now," he says. "It's like they've been driving at Indy doing 20 mph, and now there are fewer people and they've got to work."

Unrest At Ford

Tongue-in-cheek generalizations aside, some engineers and other salaried employees *are* clearly unhappy about something, as Roger Kruger's address to Ford's chairman illustrates. That Kruger is not a lone voice on the subject was reinforced by the loud ovation he received.

Kruger's argument at Ford: "The [General Salary Role] people have lost merit raises; they've lost their 3% Annual Improvement Factor; they have reduced medical benefits, a reduced Stock Savings Investment Plan and a reduced number of vacation days," he said. "Also, as an example, a top auto design engineer at Ford earns less than at General Motors or Chrysler.

"Most General Salary Role people were very disappointed with the profit sharing amount that they got. This situation has resulted in many high-potential GSR and lower management employees leaving the company. Valuable older GSR employees have been retiring at a rapid rate and virtually no new employees have been hired in the past few years.

UAW's Owen Bieber. According to the union, "Our telephone lines are open."

"My question," continued Kruger, "is how will this affect Ford Motor Co. in the long run?"

Caldwell replied that he and other Ford officials were aware of this concern and said that some improvements in the lot of the GSR people are likely to be made. "Some of the specifics you mentioned are very much in the minds of everybody, including some people here [at the annual meeting]," said Caldwell. "I can tell that by the response."

Caldwell went on to indicate the company was taking a "very broad look" at the situation, but gave little hope of returning to the gravy days before the last recession. "I don't think anybody really thinks that we can go back to exactly where we were. The world has changed all around us," he said.

"What we have to do now is to find our way through this and make sure that whatever we do, we end up being competitive, or there won't be any jobs. And if there are no jobs, we won't have to worry about the benefits."

Ford Study Underway

Caldwell indicated the study the company was undertaking, "has all the facets you talked about, including what our competitors do. I would think that as soon as we can get through the thicket, which is a little bit intense now, there will be some changes and I think they will be for the better."

Kruger responded by saying the GSR and lower management people still can't understand why, in view of the sacrifices made by all the white-collar employees, they haven't gotten anything back, especially since the top executives "have gotten everything back" with their huge bonuses. (Kruger's and Caldwell's remarks were taped and replayed for Ford employees, a practice that is customarily done monthly at Ford.)

Said Caldwell, "Without getting into a contest about it, because that isn't the way any of us feel, but it probably hasn't been recognized that those who formerly received bonuses took a major cut in their incomes.

"The General Salary Role did not [take a major cut]. There was a slowing down in the amount of increase, but this was true with respect to both the hourly and salary groups in our company.

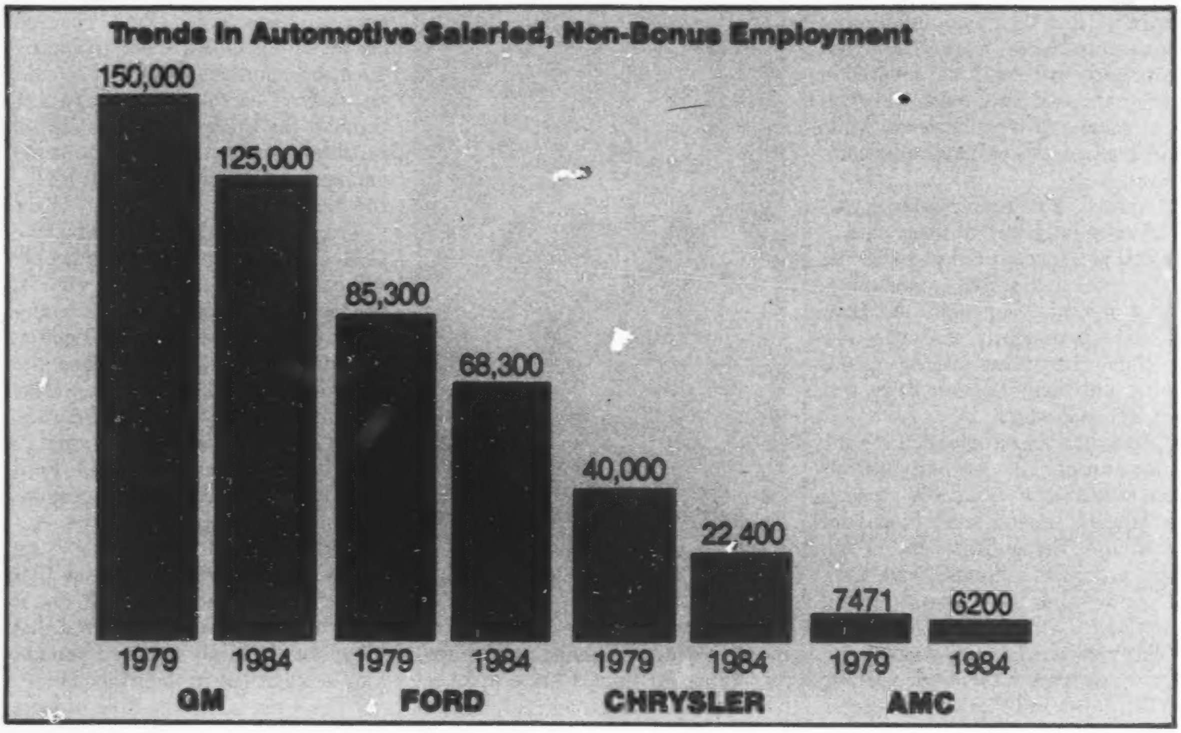
"The important thing is not to have a contest, one group versus another, because we're all in the same boat and we're all employees. And we really do intend to do something about it, maybe not going precisely back to where we were. We've got too many people in our territory who start from a totally different base and that has got to be taken into account."

Item: According to a story in the *Washington Post*, in 1982 Ford chairman Philip Caldwell received a salary of $446,000—a $26,000 raise over 1981, while the company was losing $658 million. AMC chairman W. Paul Tippett was paid $357,000, a boost of $80,000, despite a loss for his company of $153 million. And Roger B. Smith, GM chairman, received a salary of $549,000, up $74,000, when GM showed a profit of $962,000. Chrysler chairman Lee Iacocca received a $365,676 salary in 1982, which was supplemented by $1.2 million in stock options.

Item: Almost 160 test drivers and driver-me-chanics at Ford's Proving

(Continued)

White Collar Unrest


Trends in Automotive Salaried, Non-Bonus Employment

Grounds in Romeo, MI voted recently 79 to 78 to join the United Auto Workers. The drivers had previously filed suit in the Wayne County Circuit Court to recover lost wages and to reinstate merit raises. This is the largest Ford salaried group to decide on UAW representation. The Union also represents Ford salaried employees in Canada and in several small US units, including the air transportation employees and nurses.

If the one-vote margin holds up among the Proving Ground drivers, the UAW will shortly begin negotiating with the company on their behalf.

Item: A UAW spokesman, after indicating the Proving Ground election was initiated by the drivers themselves, added, "Our telephone lines are open and if anyone wants to call, we'll be glad to hear from them." The UAW claims to represent several thousand office and salaried employees at Chrysler facilities across the country and a couple hundred GM employees, including about 90 members of the Engineering and Architectual Design Staff.

Item: Earlier this year a group of salaried employees conducted a day-long series of protesting telephone calls to Ford president Donald Petersen, complaining about the company's reduced health insurance program.

Benefit Concerns

At the start of this year, Ford told its salaried workers that they could choose between two new Health Maintenance Organization (HMO) plans or the conventional Blue Cross and Blue Shield plan. But if the latter was continued, there would be an annual deductible fee of $250 per individual or a maximum of $750 per family.

There were also complaints in the press about the size of the profit-sharing amounts—about $440—paid to salaried employees. Some hourly workers got up to $600, largely because they had worked considerable overtime. Profit sharing is based on annual income.

Another demoralizing factor at Ford Motor Co. is that Chrysler Corp. and to a lesser extent the other domestic and foreign auto companies, have been luring away many Ford executives and white-collar employees. Joked Chrysler's Lee Iacocca recently, "We have outstanding people, getting stronger all the time. We sort of tell our guys to stop getting the best guys from Ford—two of their best product guys in their history just joined us."

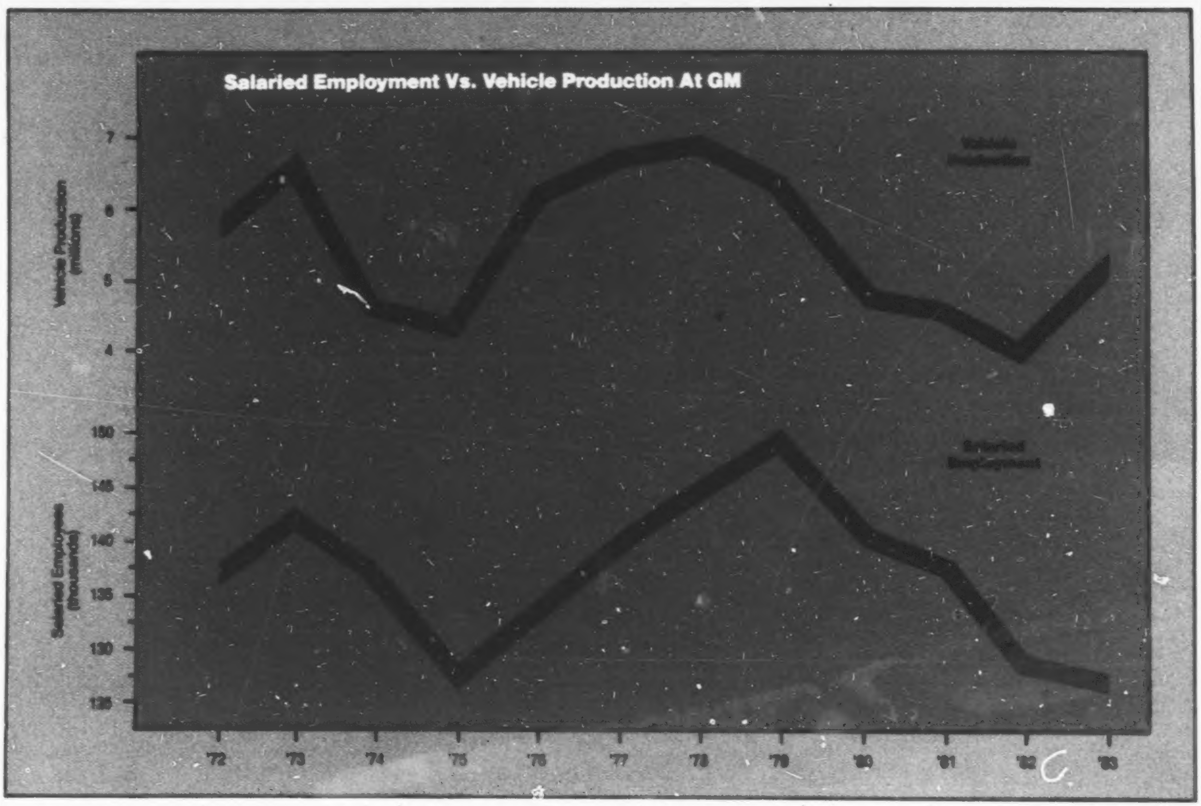
Item: Last June the publication *Business Marketing* reported that it had an internal Ford document which stated that Ford was planning to restructure its truck operations worldwide to become more competitive. The document indicated Ford Truck intended to cut employment and to buy more engineering work and components on the outside.

A Ford spokesman said this is a more or less general trend within the company and cracked, "But we'd like them to return the document. After all, it belongs to us."

Item: Edson Williams, VP and general manager of Ford's truck operations made this point: "We've stocked the managements at Chrysler, Harvester, Nissan and Toyota." A reporter added American Motors, where thechairman and top sales executive both learned the auto business at Ford.

960 Unionized

About 960 Ford salaried office workers are now represented by the independent Society of Engineering Office Workers (SEOW) at seven lo-



cations: Rouge Steel, the Central Laboratory, Dearborn Stamping, Dearborn Engine Plant, Romeo Tractor, Utica Trim and Mt. Clemens Paint.

No one is saying the entire white collar forces within the Big Three will go union anytime soon and thus present the car companies with a double edged sword of contract negotiations every 3 years—the UAW is currently up to its neck preparing for the September blue collar contract talks and the major UAW effort made last year to organize the GM salaried workers in Flint and Warren, MI and elsewhere resulted in defeat. But what about the future?

The Best And The Brightest

There appears to be an exodus of the best and brightest employees from the auto companies into surrounding industries. Some headhunters in the Detroit area have indicated they are receiving more applications from auto company middle managers wishing to leave the carmakers yet remain in the area. The extent to which the brain drain continues will hinge on how well the auto companies soothe the unrest within their ranks.

Item: Ford is completing a survey of its white collar employees by the personnel and organization staff. It's an hour-long, machine-graded questionnaire focusing on how the employee feels about trusting his or her supervisor, motivation, and what's good about Ford and what isn't. "It's all aimed at attitude and motivation," said one design engineer who just completed the survey.

Ford's PR staff confirmed the existence of the survey, but said the results won't be available internally until late summer. The survey isn't new; it's been done every two to four years for at least two decades. "That gives us previous surveys to compare against to see if anything's changed," said a ranking Ford executive.

Item: A recent General Motors press release stated that the cost of an hour of labor, blue and white collar, to GM has reached an "all-time" high. "The cost of an hour of labor, including the cost of benefits, has risen from an average of $19.80 per hour in 1981 to an average of $21.80 per hour in 1983. In the first quarter of 1984, this cost per hour averaged $22.40, and there is every indication that it will continue to rise. This amounts to an annual total labor cost of more than $46,000 per employee."

Item: According to David Burror, chief exec at Logitek Inc., a Troy, MI integrated computer systems company, "Job obsolescence will affect the white collar worker much worse than the blue collar worker, and that's a fact." (Burror was quoted in *The Wall Street Journal.*)

Item: A recently released UAW bargaining document lists "equality of sacrifice" in layoffs of non-union salaried employees as one of the union's objectives in its talks with Ford.

Item: Groused a veteran Ford white collar quoted by *Reuters Ltd*, "Our morale in a profitable year is as low as it's ever been. We think we can compete with the Japanese without having to live like them. We want to continue to live like Americans." ■

Reported by the author, Douglas Williams and other AI *editors.*

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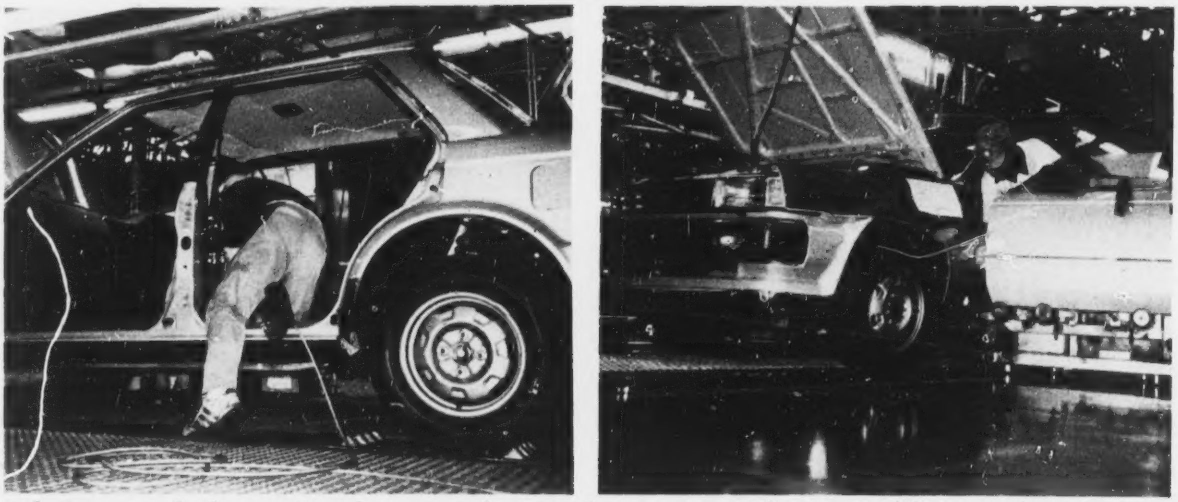
No.2 INSIDE JAPAN

HOW WORK PRACTICES SEND PRODUCTIVITY SOARING

In our continuing series on the Japanese auto industry, we take a look at the world's most efficient and fastest assembly lines with an eye toward how these high productivity ideas can be adopted here.



Left: Removing the doors at Nissan's Oppama plant provides easy access to the interior of the car. Right: Doors are re-attached at the end of the assembly line. The employee merely drops pins through the hinges.

by John McElroy

I stepped off the bullet train in Nagoya, set my bags down on the platform and looked all around. I didn't know where to go.

I knew my hotel was adjacent to the station, but I couldn't even read the sign to know which stairway to take to get off the platform. So I pulled out my map and the compass that I had accidently packed, found my bearings and set off to find my room.

I hadn't taken two steps when it occurred to me, that in a way, things had come full circle. In the early 1950s the Japanese had come to the United States to learn how the Americans were able to build cars so efficiently. Like me at the train station, they weren't even sure where to start.

But now, 35 years later, I was in Japan to find out how the Japanese had taken what they learned in America and improved on it.

Basically, I knew what to expect. I had read quite a bit about Japanese assembly operations and had talked to a number of American auto executives to determine what they look for when they take plant tours and how they measure the efficiency of an operation.

I also had toured many American auto plants so I could establish a good basis for comparison. But it's one thing to read and talk about things and another to see them with your own eyes. And what I saw were some of the most efficient and fastest assembly lines, cranking out high quality products.

But what I also learned is that there is no magic, culture or technology that gives the Japanese any manufacturing advantage. What they do is use their resources more efficiently. What follows below are some of the basic differences I saw between American and Japanese assembly operation.

Japanese Plant Complexes

Generally speaking, a Japanese assembly plant is actually part of a huge complex that includes engine and transmission assembly, forging, casting and a host of other operation. The Japanese got the idea for congregating many operations into one complex by looking at the way many old American facilities, such as Ford's Rouge complex, are set up. It may be an old idea, but it's still a good one, as evidenced by the up-coming Buick City complex.

The reasons a manufacturing complex makes good sense are many. First, by having all buildings close together, the supply lines between operations can be very short. Anyone who understands the importance of

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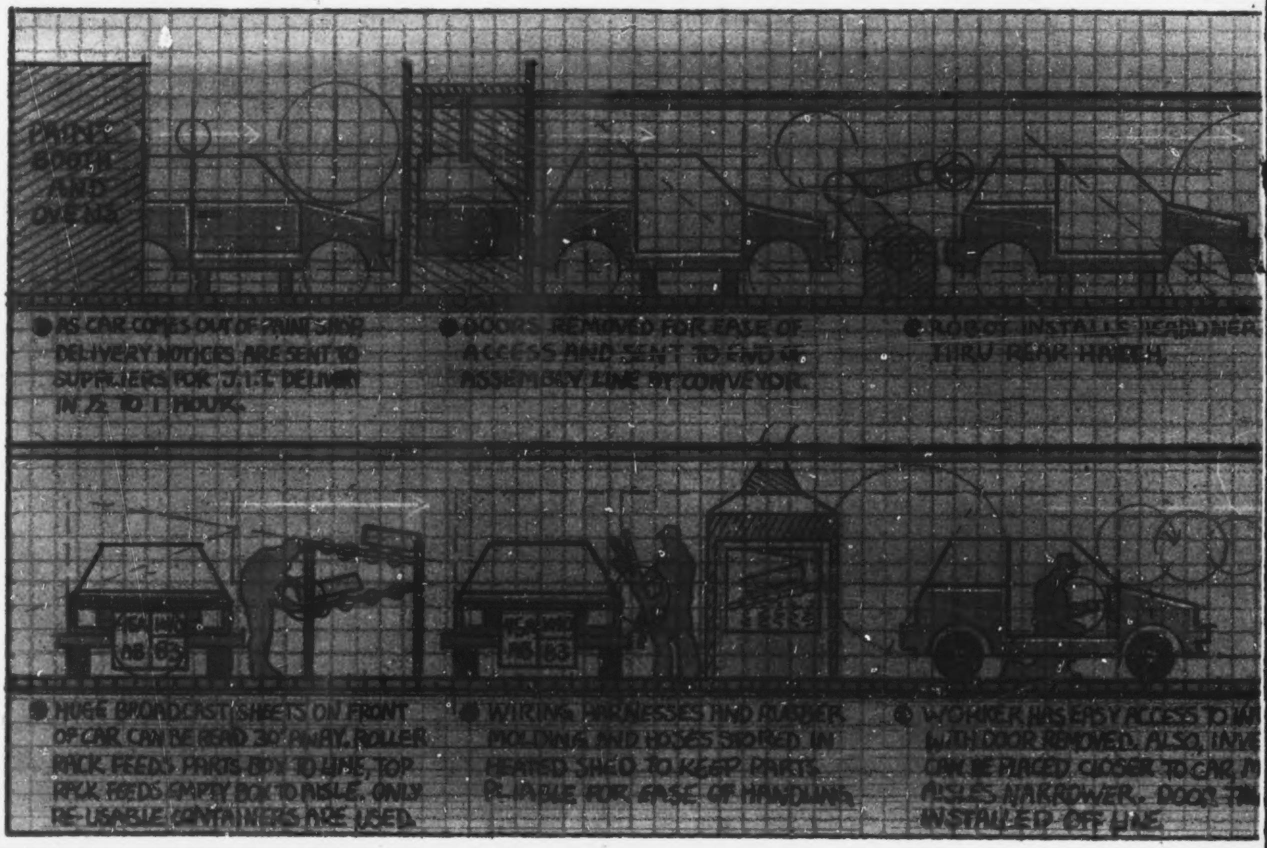

PAINT BOOTH AND OVENS
● AS CAR COMES OUT OF PAINT SHOP DELIVERY NOTICES ARE SENT TO SUPPLIERS FOR J.I.T. DELIVERY IN ½ TO 1 HOUR.
● DOORS REMOVED FOR EASE OF ACCESS AND SENT TO END OF ASSEMBLY LINE BY CONVEYOR.
● ROBOT INSTALLS HEADLINER THRU REAR HATCH.
● HUGE BROADCAST SHEETS ON FRONT OF CAR CAN BE READ 30' AWAY. ROLLER RACK FEEDS PARTS BOX TO LINE, TOP RACK FEEDS EMPTY BOX TO AISLE. ONLY RE-USABLE CONTAINERS ARE USED.
● WIRING HARNESSES AND RUBBER MOLDING AND HOSES STORED IN HEATED SHED TO KEEP PARTS PLIABLE FOR EASE OF HANDLING.
● WORKER HAS EASY ACCESS TO IN WITH DOOR REMOVED. ALSO, INVE CAN BE PLACED CLOSER TO CAR, M AISLES NARROWER. DOOR TR INSTALLED OFF LINE.

Newest Japanese And US Assembly Plants Compared

	SUZUKI	**MAZDA**	**GMAD**
	Kosai	Hofu	Lake Orion
	completed 10/83	*complete 10/82*	*completed 12/83*
Plant Size	553,270 ft²	1.5 million ft²	3.7 million ft²
Products	Cultus (Chevy Sprint)	626	Cadillac & Olds C-car
Line Rate	30/hour 60,000/year*	62.5/hour 240,000/year plus 21.8 CKD/hour 80,000 CKD/year	75/hour 260,000/year
Employment	600*	1800	6700
Man-Hours Per Car	20†	14‡	48.7
Wages	approx. $7.40/hour $14,200/year§	$10.55/hour $20,300/year§	$12.67/hour $26,350/year§
Absenteeism	4% total	4.5% total	1% (excluding AWOL)
Inventory	4 hours average	30 minutes min., 1 day max.	6 hours average of high cost items
Relief System	Mass	Mass	Mass
Robots	137	155	157

**=one shift*

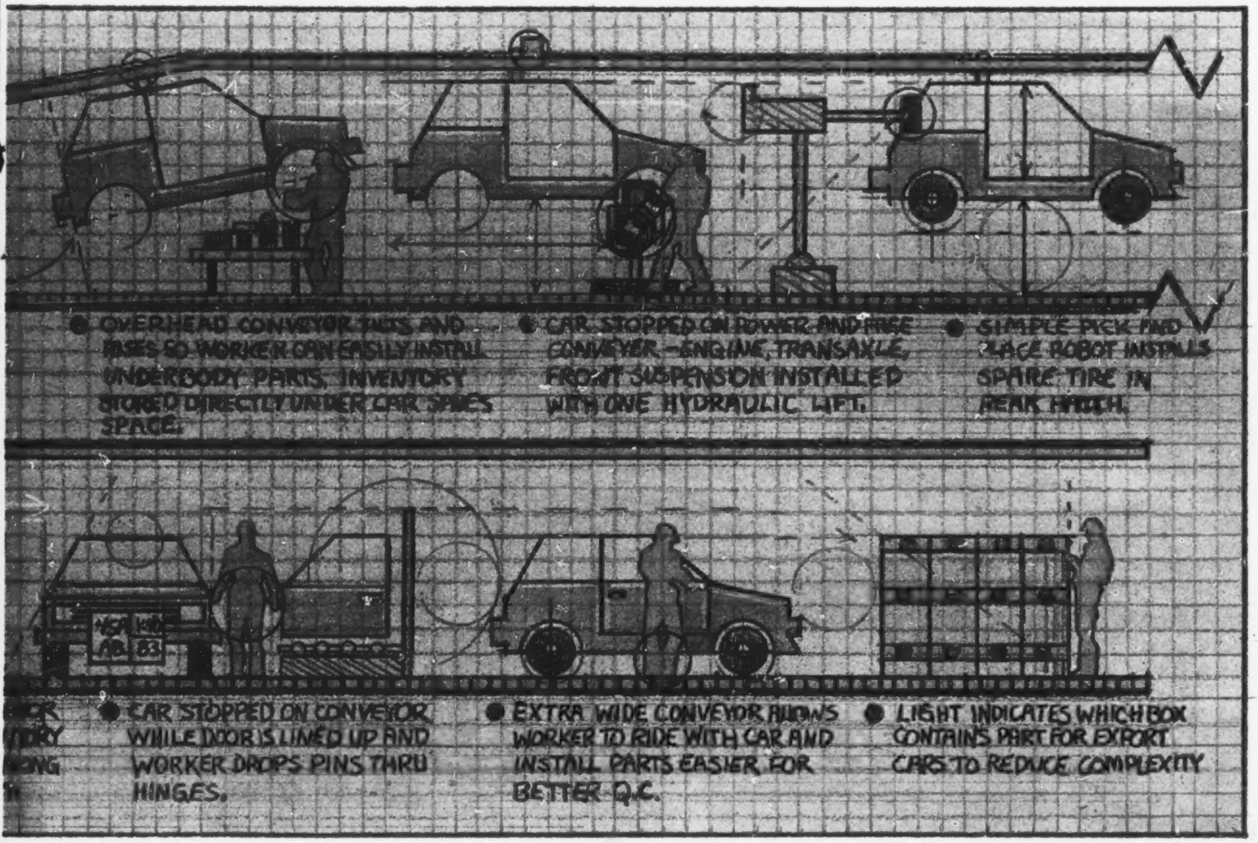
†=includes stamping and engine & trans. as'mbly

‡=includes stamping

§with bonuses, excluding fringe benefits

Although the newest American assembly plant has more robots and high-tech equipment than its Japanese counterparts, it uses far more floor space, employees and man-hours of labor to produce a car.

Source: Automotive Industries


OVERHEAD CONVEYOR TILTS AND RAISES SO WORKER CAN EASILY INSTALL UNDERBODY PARTS. INVENTORY STORED DIRECTLY UNDER CAR SAVES SPACE.
CAR STOPPED ON POWER AND FREE CONVEYER—ENGINE, TRANSAXLE, FRONT SUSPENSION INSTALLED WITH ONE HYDRAULIC LIFT.
SIMPLE PICK AND PLACE ROBOT INSTALLS SPARE TIRE IN REAR HATCH.
CAR STOPPED ON CONVEYOR WHILE DOOR IS LINED UP AND WORKER DROPS PINS THRU HINGES.
EXTRA WIDE CONVEYOR ALLOWS WORKER TO RIDE WITH CAR AND INSTALL PARTS EASIER FOR BETTER Q.C.
LIGHT INDICATES WHICH BOX CONTAINS PART FOR EXPORT CARS TO REDUCE COMPLEXITY

Above: Composite of efficient final assembly operations

kanban or just-in-time (JIT) inventory control can appreciate that.

Second, you can run the complex with one staff and one powerhouse, which eliminates a lot of redundancy. Some Japanese complexes are located right by the ocean with their own docks and shops so that the cars can literally come off the assembly line and be sent to the shops that are only a couple hundred yards away.

Very Flexible

Another aspect common to all Japanese assembly plants is that they have the ability to build two or more different car lines. In fact, it is not all all uncommon to see front-wheel-drive and rear-wheel-drive cars, both left hand and right hand drive, coming down the same line, one right after the other. This is done so that production of one type of car can be quickly shifted to another if sales of one car slip while the other soars.

The Japanese told me that they started doing this after the 1973 oil crisis, when large car sales dried up, idling a number of facilities. An added advantage of making several different cars in one plant is that it makes it much easier to balance line operations and maintain routine schedules. That makes kanban and JIT easier to do as well.

In a chronological sense, any description of Japanese assembly plants should start with tamping operations. But there is enough involved there that it's worth a separate story in a later issue.

Body Assembly

If there is any part of assembly operations that differ amongst Japanese assembly plants, it's probably body assembly. It seems that each company has its own idea of the best way to weld a car together. But compared to new American assembly plants, there is one noticeable difference. I never saw one Robogate line in Japan. For the most part they use multi-spot press welders.

For all their differences, there are several things common to all Japanese body assembly lines—they are all cramped and crowded, and they all use simple robots. Most Japanese car companies design and build many of the robots they use. As a result, their robots are cheaper to install, service and repair. These simple robots only have two or three axis of movement.

For example, floor pans will be moved from welding station to welding station by a lift-and-carry conveyor. At each station a hydraulic ram will raise the floor pan to the height of the horizontal robot arm. At that point, the whole robot (not just the arm) will index in and perform its welding program.

An exception is Subaru's Gunma plant, which is probably the most heavily robotized plant in Japan for its size. They have many sophisticated

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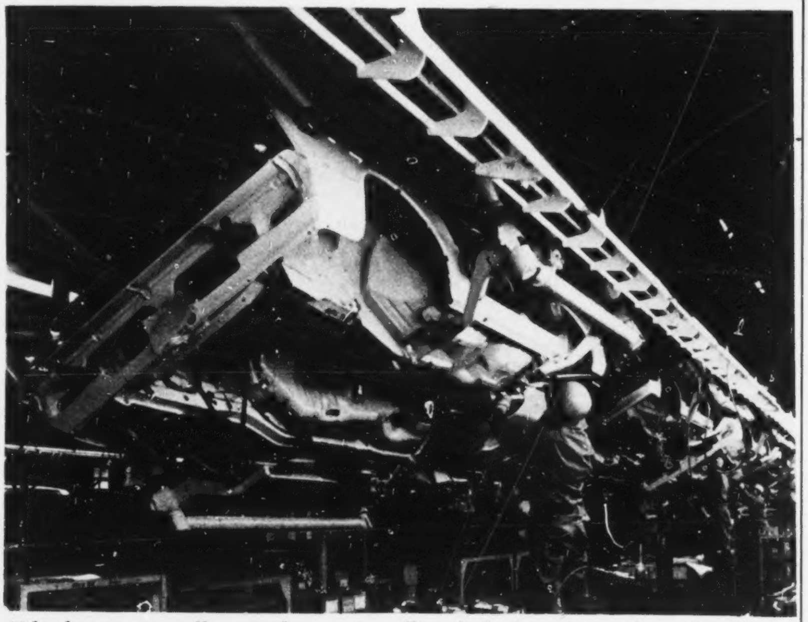

Tilted conveyors allow workers to install underbody parts easily without having to stretch or crane their necks. Shown is the trim line at Nissan for its 210 model.

robots, including robots that hold parts for other robots to weld. Since Subaru only has this one assembly plant, the company feels it needs as much programmable flexibility it can get to build all its different models.

Recently, the Japanese have begun to use sophisticated vision-equipped robots in operations such as applying underbody sealer. But compared to new American plants, the Japanese don't use more robots, either in welding or anywhere else in their assembly plants.

Batch Production

At the other end of the spectrum in body assembly is Honda's Suzuka plant. Rather than go for maximum flexibility, Honda batch produces its cars. In other words, you'll see an hour's worth of red, two-door hatchback Civics, all going down the line in one batch.

But to get the flexibility it needs to produce different models, Honda uses two multi-spot welders that are mounted on rails. When they want to change from one model to another, they'll stop the line, push one multi-spot welder out of the way and move the next one into place. That may sound a little strange, but Honda must know what it's doing. The line runs at 84 cars an hour! [Note: time and time again, I saw equipment mounted on rails for quick tool and die change.]

Yet another example of body assembly flexibility is at Mazda's Hofu plant. At the final welding station, three different fixtures are mounted to a rotating cylinder and there is a cylinder set horizontally on each side of the line. The cylinders index to present the fixture they need to weld the type of car they want to build-323, (GLC), 626 or RX-7. Presently, however, Hofu only makes the 626.

Honda also has a slick automatic door hanging machine that was designed and built by Honda Engineering. The doors come from the welding line by conveyor and are fed to the door hanger which automatically aligns the door to the body (which is stopped at this station) and runs in the hinge bolts.

There are other differences between American and Japanese body assembly lines. For one thing, many American stamping operations also weld parts such as doors and floorpans, but in Japan that's only done in the body assembly line. And all Japanese body assembly operations operate with mass relief, though this is true of many American today.

But most importantly, the Japanese line achieve 98% first-time-through capability, meaning only 2% of the car bodies need to be sent through the line again for re-work or repair. The best American plants have 88% first time through capability.

Paint Operations

To a company, no Japanese automaker would allow me into their paint booths. The typical excuse was that we couldn't go through their "clean rooms" because we would track in too much dirt and lint. But I suspect the real reason is that the Japanese auto companies are currently robotizing their paint operations and they didn't want me to see what they were installing.

I ran across this secretiveness in many areas. At first I thought they were trying to hide their latest technology, but as time went on I began to realize they also didn't want me to see how they implement and operate their equipment. And in some cases I think they didn't want people to know how they were able to get away with such simple equipment.

Nonetheless, I was able to get some important information about Japanese paint operations. For one thing, this is one area where they will operate with tag relief. And there are no high-bake repair ovens. With strict adherence to quality control, they are able to achieve 95-98% first-time-through capability. So since very few cars need to be repaired, they can handle all repairs on the two-tons line.

Final Assembly

I saw so many neat ideas in the final assembly area of each Japanese plant, that it's difficult to generalize. Still, there are some basic similarities.

All final assembly areas operate with mass relief and this is the one area that relies heavily on manual labor. A crucial difference compared to most American plants is that each production worker doubles as an inspector. Although they have QC inspectors at the end of the line, the idea here is to prevent a bad part or sloppy work from going to the next station. As a result, Japanese assembly plants operate with hundreds of fewer repairmen and inspectors (see chart).

As a car comes out of the paint shop, delivery notices are sent out to the suppliers who have between ½- and 1-hour to get their parts to the line. Actually, the suppliers have received a build forecast a month in advance, and this final notice is used to "fine tune" what is needed. As a result, the suppliers will deliver seats, headliners, carpeting, and other items in the sequence and color that will be used. In most American plants, by comparison, the suppliers' delivery notice is sent out when the floor pan is built, thus adding another 10 to 12 hours into the supply system.

At many Japanese plants, though not all, the doors are removed from the car before it goes down the trim line. This offers several advantages. First the line workers have easy access to the interior of the car, thus simplifying operations.

Second, the door trim, glass and hardware can be installed on an off-line operation, ensuring better fit and finish. And last, the aisles can be narrower, so the production workers are never more than one step away from the parts they are installing. The doors meet up with the car at the end of the line where they are aligned with the car and a worker drops pins through the hinges.

Better Ergonomics

The Japanese place heavy emphasis on work-place ergonomics to get better quality and employee satisfaction. Several simple examples include:

- Huge broadcast sheets that can be read 30 feet away. This allows production workers to look two to three cars down the line, so they know what parts to have ready.
- Many plants use simple pick and place robots to install the spare tire. It may not sound like much, but I'm sure these robots cost well under $20,000, meaning they pay for themselves in less than a year.
- One slick idea Suzuki uses is to store its wiring harnesses and rubber moldings in a heated shed to keep them pliable and easy to handle. Plus, the electrical connectors expand because of the heat, making it an easy matter to plug them together.
- At Mazda's Hofu plant an extra wide conveyor allows production workers to ride along with the car, rather than have to walk along it, trying to install parts.

Japanese Manpower Savings Detailed

Section	Manpower Savings
• Unauthorized absenteeism	240
• Mass relief	220
• Union committeemen	30
• JIT inventory control	350
material handling: 270	
invnty. cycle chkers: 40	
mat'l handlg. repairmen: 40	
• Quality control	450
inspectors: 210	
repairmen: 240	
• Material handling engineering	50
no cardboard or wood: 50	
• Plant complexes	160
staff	
powerhouse	
• Organization levels	120
4 levels vs. 6-7	
• Sourcing	180
purchasing complete seats	
purchasing balanced and mounted tires and wheels	
Total Savings	**1830**

Source: Harbour & Assoc.

Listed is a breakdown of where the Japanese automakers are able to use fewer employees compared to an American assembly plant. Although it is not listed here, flexible work rules permit even greater levels of efficiency. Note that American plants would be unable to achieve this efficiency simply by adding automation.

Perhaps the greatest advantage that Japanese plants have over their American counterparts is in their material handling. But it is an advantage that derives from simplicity, not high-technology.

For one thing, you will never see any cardboard packing or wooden pallets in a Japanese assembly plant (Nissan excepted). They eliminate their dunnage by using re-usable containers. And since only small quantities of parts are delivered to the plant, they can be handled by a "train" of carts pulled by a small truck.

The containers are placed on roller racks that are inclined toward the assembly line, while the empties are placed on the top rack and roll to the aisle. If big bins are needed for heavy parts, such as starters, the bins are designed to tilt forward so the workers don't have to bend over and reach into them.

Delivery trucks are also equipped with roller racks so that parts can be unloaded quickly. I watched one truck back up to a shipping dock at Mazda's Hofu plant where a chain conveyor operated by the driver unloaded two racks containing 75 engines in less than 1 minute. And I saw the same thing done at Suzuki's Kosai plant with seats which were then automatically loaded on another conveyor which brought them to the assembly line in the sequence they would be used. I rarely saw any fork-lift trucks and I never saw an automated guided vehicle system.

Suziki's Kosai plant also installs the powertrain and front suspension with only one hydraulic lift. To do this they stop the car, rather than have a carousel with many lifts tracking with the line. Not only is it simpler, it saves a lot of floor space and investment in lifts.

To handle the complexity of different cars going to different countries, Mazda also has a parts bin with different lights to indicate which part the worker should pick up to put on the car. Presently this is used for different types of coolant and owner's manuals, but it's an idea I suspect will spread. However, it occurred to me that this could also be handled with color-coded broadcast sheets.

One other thing I saw at Mazda was workers turning off all the lights and equipment during their lunch break to conserve energy.

Conclusions

As a result of attention to detail and scrupulous efforts to reduce inventory and defects, Japanese assembly plants are more efficient than their American counterparts. They have some slick innovations, to be sure, but their efficiency does not come from greater numbers of robots or new technology. Indeed, it seems to me that the American automotive industry has a broader technology base than the Japanese. But now it's time for the teacher to copy a few things from the students and to improve on them.

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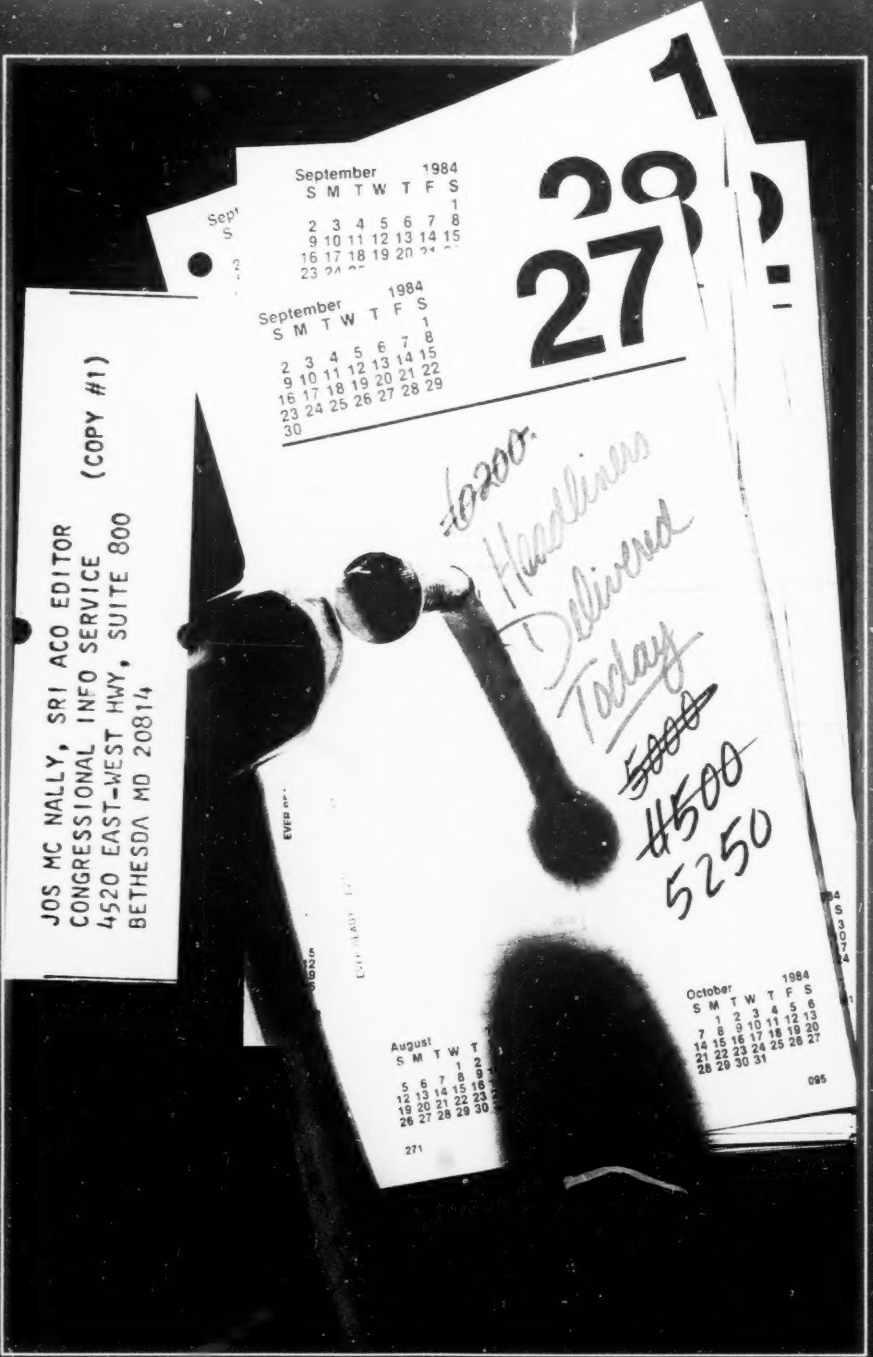
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Nailing Down Dates
STABILIZING PRODUCTION SCHEDULES

Materials '85
What Downsizing Has Wrought

Inside Japan
Quick Die Change: The Times To Beat

CHILTON'S
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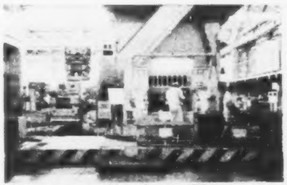
*Does not appear in all issues



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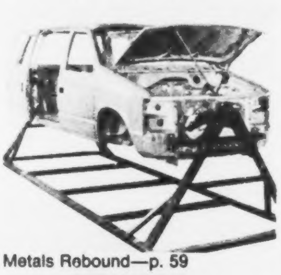

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Nailing down shifty production schedules is becoming *the* problem of the '80s for US automakers. And JIT is making matters worse.

NEXT MONTH

New Cars '85: the guts, the glamour, the glory—the goofups. Also: *AI's* SPC Roundtable and all the new cars Europe has to offer.

QUOTABLE

"At our current and future projected level of sales, the company would not and could not meet the content requirements of the law and be a successful competitor in the US market. It is not likely that Nissan would make new investments. Our future growth and indeed our current operations would be jeopardized."—Marvin T. Runyon, president and CEO of Nissan Motor Mfg. Co. USA, commenting on proposed legislation which woulddetermine domestic content ratio by a company's sales volume. Nissan estimates it would be required to meet a content ratio of 70%.

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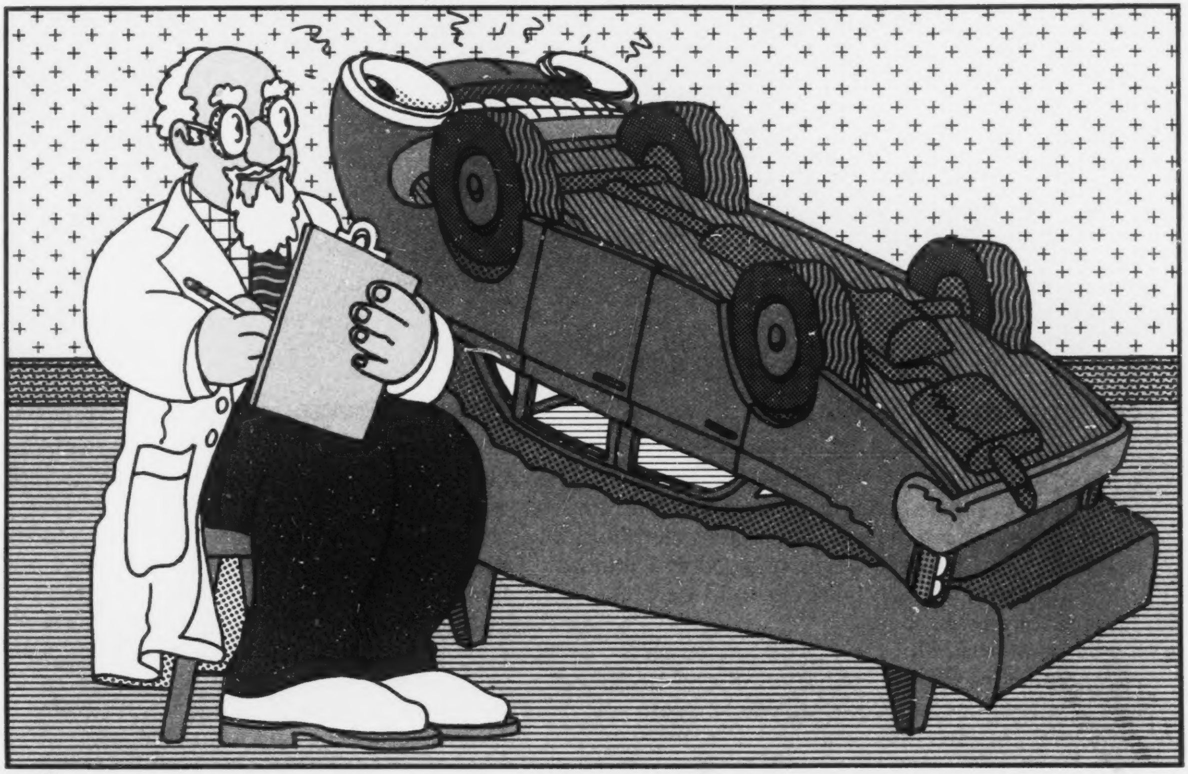
Psychographics & The Auto Industry

DETROIT GOES PSYCHO!

The automakers are examining new marketing tools in hopes of reaching just the right buyer in just the right niche. Psychographics is Detroit's latest 'buzz-word,' but demographics still has a lot of mileage left in it.



"SO, WE'VE TRACED YOUR INFERIORITY COMPLEX BACK TO THE DAY YOUR OWNER TRADED YOU IN ON A LITTLE IMPORTED CAR..."

by Elizabeth A. Capelli

Here's an election year grabber for you: "In 1972, all Volvo owners voted for George McGovern." That's Thomas O'Grady, director of Automotive Services at Chase Econometrics, giving a whimsical example of how consumer psychographics could change the way cars are designed and marketed in the very near future.

O'Grady, formerly with GM's market analysis and forecasting group, bases his assumption on the psychographic profile of Volvo owners at the time.

Psychographics, like the more commonly used marketing tool of demographics, categorizes people into groups as an aid to marketing products. Rather than using age, income and education as does demographics, psychographic information categorizes the general psychological wants and needs of consumers to determine whether a person will buy a given product.

Although psychographics is not new, it is new to Detroit, and is certainly raising some controversy there.

"Psychographics is helpful, but only in a broad sense," says Charles Kitz, director of Business Planning and Consumer Research at Chrysler. "Demographics is much more predic-

Elizabeth A. Capelli is an Editorial Intern from Villanova University.

tive, especially in the targeting sense.

"[The psychographic categories] 'survivors,' 'sustainers,' 'achievers,' etc., are categories based on attitudes and behavior, yet these attitudes are basically driven by income, education and age—all levels of demographics," Kitz says.

"Refinements and adjustments will be made to improve vehicle quality. However I don't believe the use of psychographics and demographics will change the approach strategy," Kitz concludes.

Fragmented Consumers

One reason psychographics has attracted the attention of at least some automakers is Detroit's recognition of an increasingly segmented market of automotive consumers. Lloyd E. Reuss, VP of General Motors' new small-car group, explains. "We've treated the car market as a mass one, but now I'm convinced that concept is dead," he says. Reuss claims that target marketing—specific products aimed at specific groups, sometimes in specific areas—will be the kingpin of future marketing.

Buick's John Dabels, general director of marketing and sales planning, elaborates. "The industry is breaking down the traditional market, and breaking away from 'price/size' relationships," says Dabels. "The target market emphasis today is mostly based on an appeal to certain groups, and this emphasis has broken away from the traditional way of thinking."

Dabels predicts that Buick may develop specific cars to appeal to specific groups in the future. In doing so, marketing will go "beyond the [traditional] media," Dabels explains, and will include more specific forms of media such as regional special edition magazines and direct mail. Buick has already increased its use of direct mail marketing, he adds.

The implications of this trend for the auto industry, and its advertising media, are enormous.

Database Resources in Marketing

Market research companies have been quick to capitalize on this new trend with sophisticated, computer-aided tools. Vast amounts of consumer data are acquired by such programs as: PRIZM (Potential Rating Index Zip Market), developed in 1974 by Claritas Corp., a consulting company that specializes in target marketing campaigns; and VALS (Values And Life Styles), developed at Stanford Research Institute (SRI) in 1978. Information from this data provides companies with psychographic, demographic and "geo-demographic" data categorizing the needs of new consumer segments.

(According to officials at both SRI and Claritas, PRIZM and VALS will merge before the end of the year).

Of the two programs, VALS is more deeply involved with psychographic information, according to Brook Warrick, senior consultant of the VALS program at SRI. It categorizes people on the basis of their attitudes, needs, wants, beliefs and demographics, he says. SRI and the VALS program were key in honing the use of psychographics for corporate marketing.

Psychographics was first developed in the early '50s, but was never really successful, according to Warrick. It hasn't been until recently, say the past 5-6 years, that psychographics has been actively used in marketing, he remarks.

The Outer & Inner Psycho

The basic tool of the VALS program is the VALS typology. This is divided into four major categories: need-driven, outer-directed, inner-directed and integrated. Included in these four categories is a total of nine lifestyles: survivors, sustainers, belongers, emulators, achievers, I-am-me, experiential and societally-conscious.

Members of VALS, almost 130 corporations, use the findings in market research, product development, packaging and design, strategic planning, advertising and human resources. (Non-members may have access to information, however, follow-up material, statistics and reports are only provided to subscribers.)

The automotive industry provides the best example of applying the data in market research.

Participants interested in market research have access to the large database collected annually by Simmons Market Research Bureau (a marketing database resource used by PRIZM as well). Data from the surveys cover demographics, media usage, consumption of products, etc. VALS participants also have access to data on several thousand product brands and media specifics, explains Warrick.

These data are applied by researchers in order to segment markets, estimate market size and position products and services. For the auto industry, for instance, VALS data show that:

- *Achievers*, (a lifestyle which constitutes 20% of the population), under the *Outer-directed* category, buy more large and luxury cars.
- *Belongers*, (39% of the population), under the *Outer-directed* category, tend toward "family-sized" cars.
- The *Societally Conscience*, (11% of the population), under *Inner-Directed* category, purchase more gas savers.
- The *Need-Driven*, (11% of the population), purchase used cars.

Furthermore, big differences exist in how many cars the various lifestyle households are likely to own, their assessment of features desired, how they are used, etc.

But Does It Help?

As SRI's Warrick explains it, the high penetration of foreign cars in America may be due to a change in the psychology of the auto marketplace. "Detroit can't understand why 'we' purchase foreign cars," he says. "It's due to one of the major value groups. Values are different than in the past . . . and will continue to change in the future."

Chrysler's Kitz is not necessarily convinced of the value of pyschographics in marketing cars. He says that some psychographic information is helpful, yet some of it is redundant. "Most of the data we received was information that was already known. We find that the most reliable and available source of information we can get is from the people—the buyers themselves.

"Psychographics has not really added any fundamental change to car marketing, or had any effect upon Chrysler directly," says Kitz, "however it can be useful as a reinforcement. It really is just common sense

(Continued)

what type of person is going to buy what type of car."

Kitz also mentions the role the mass media plays in the car market. "You wouldn't expect to see a TV commercial of a young man in his 20s getting out of a black Lincoln Continental ready to play tennis, or you wouldn't see a woman in a long evening gown get out of a small sporty car. It's just not expected."

(Chrysler is among the few corporations which is not a member with VALS. However, the following corporations are members of the program: AMC, GM, Honda Research of America, Mercedez-Benz of North America, Mitsubishi Motor Sales, Nissan Motor Corp. USA, Regie Renault and Volvo of America Corp.).

Geo-Demographics

All this interest in psychographics doesn't mean that demographics is dead as a marketing tool. "Psychographics and demographics are valid and very valuable in marketing if they are used together," explains Chase's O'Grady. "They will get a lot more sophisticated and will be used to a greater extent in the future. They are focusing more on the consumer now, and less on the changing economical platform."

One such sophisticated marketing tool using demographics is PRIZM.

The VALS Segments Explained

Need-Driven. . . buy more out of need than choice.

	Survivors	Sustainers
% of population	4%	7%
Lifestyle	Struggling for survival. Distrustful.	Hopeful for improvement over time. Concerned with security.
Buying Style	Price dominant. Focused on basics.	Price important. Want warranty.

Outer-Directed. . . buy with an eye to apperances and in accord with established norms

	Belongers	Emulators	Achievers
% of population	39%	8%	21%
Lifestyle	Preservers of status quo. Seek to be part of group.	Upwardly mobile. Emulate rich and successful.	Materialistic, comfort-loving. Oriented to fame and success.
Buying Style	Do not want to try something new. Heritage brand buyer.	Conspicuous consumption. Sacrifice comfort and utility for show.	Luxury and gift items. Like 'new & improved, but not radically changed, products.

Inner-Directed . . buy to satisfy their self-expressive, individualistic needs

I-Am-Me	Experiential	Societally	Conscious
% of population	3%	6%	12%
Lifestyle	Transition between outer & inner directed. Very individualistic	Seek direct experience. Intense personal relationships.	Simple, natural living. Socially responsible.
Buying Style	Impulsive. Trendy products.	Process over product. Interested in what product does for them, not what it says about them.	Discriminating. Want true value and environmentally sound products.

Integrated. . . rare people who have melded power of the Outer-Directed with sensitivity of the Inner-Directed. Their lifestyle is one of tolerance and self-assurance; their buying style is oriented to ecologically sound, esthetically pleasing, one-of-a-kind products.

Source: Vals Program—SRI Institute

VALS is a system developed by SRI International for categorizing consumers according to their values and lifestyles. The VALS typology provides comprehensive segmentation into nine specific groups. Each group is so distinctive in behavioral make-up that it can constitute a specific market segment. By targeting these groups, the effectiveness of marketing and advertising strategies can be improved.

By combining demographics with basic Census information, it produces "geo-demographics". This data describes demographic as well as socioeconomic groups at the neighborhood level.

In the mid '70s, Claritas Corp. used US Census data to classify all residential neighborhoods in the US, and assign those to homogeneous groups. The PRIZM system is used by marketers to answer three basic questions:

- Who are my best customers?
- Where can I find more people like them?
- What are the most cost-effective means of reaching and motivating these better prospects?

Bruce Mac Nair, account services manager of Claritas, says the program currently provides useful information to many companies including divisions of GM and Ford, AMC, and such imports as Subaru, American Honda and Toyota.

PRIZM's Advantages

Mac Nair points out that advantages of geo-demographics over other systems are: greater variance in behavior; more accurate definition of important consumer target groups; and the ability to focus marketing efforts on selected target groups at national, regional and local levels.

PRIZM has identified 40 distinct

How PRIZM Zip-Clusters Show Buying Habits

Quintile 1

Zip-Cluster Nicknames	Base % Comp.	Market % Comp.	% Pen.	Index Conc.	Rank
Grain Belt	1.48	3.28	0.449	221	1
Agri-Business	4.12	6.40	0.315	155	2
Tobacco Ro[illegible]	1.01	1.52	0.307	151	3
Share Croppers	3.66	5.52	0.307	151	4
Gray Power	2.02	3.03	0.305	150	5
Furs & Station Wagons	2.23	3.12	0.284	140	6
Golden Ponds	2.96	4.01	0.275	135	7
Blue Blood Estates	0.62	0.81	0.267	132	8
Quintile 1 Averages	**18.10**	**27.69**	**0.311**	**153**	

Quintile 5

Zip-Cluster Nicknames	Base % Comp.	Market % Comp.	% Pen.	Index Conc.	Rank
New beginnings	4.80	3.19	0.135	66	30
Old Yankee Rows	1.92	1.20	0.127	63	31
Downtown Dixie-Style	2.41	1.41	0.119	58	32
Emergent Minorities	2.21	1.22	0.112	55	33
Heavy Industry	2.09	1.08	0.105	52	34
Single City Blues	2.20	0.77	0.071	35	35
New Melting Pot	1.37	0.41	0.060	30	36
Hispanic Mix	1.60	0.47	0.060	29	37
Public Assistance	2.48	0.62	0.051	25	38
Bohemian Mix	0.83	0.15	0.036	18	39
Urban Gold Coast	0.47	0.05	0.023	11	40
Quintile 5 Averages	**22.38**	**10.57**	**0.096**	**47**	

This section of a PRIZM report basically divides US households into five Quintiles, each comprising about 20% of the total (shown here are the first and fifth quintiles). The Base % Composition column shows each group's size in relation to all other groups. The Grain Belt zip-cluster, for example, shows that 1.48% of all US households are in Grain Belt-type neighborhoods.

The Market % Composition column shows that Grain Belt households bought 3.28% of the domestic full size cars in 1982. The % Penetration column shows the fractional penetration of full size domestic cars in the Grain Belt-type neighborhood.

The Index of Coincidence is a multiplication of the Base % Composition column and the Market % Composition column. In this case it indicates that Grain Belt-type neighborhoods are 2.21 times as likely to buy a full size domestic car as the average.

Comparing the top ranked Quintile in this report to the bottom ranked Quintile, as we have done, shows that the neighborhood types in Q1 are three times as likely to buy a full size domestic as the neighborhood types in Q5.

This is the most basic of all the PRIZM reports.

"MITCHELL JUST DISCOVERED HE'S TOO OLD TO BE A YUMP."

neighborhood types, or clusters, which are ranked and grouped according to recognized socio-economic levels.

Each cluster was assigned a number at random by computer, and after intensive studies on the clusters each was assigned an Archie-Bunker-type nickname. For example, educated, affluent executives and professionals in elite suburbs were called "Blue Blood Estates," "Money and Brains," and "Furs and Station Wagons."

Upper-middle class, child-raising families in outlying suburbs were given such nicknames as "Young Suburbia," and "Blue-Chip Blues."

Separate analyses of Census data have assigned neighborhoods to PRIZM Clusters based on the following geographic units: Zip Codes (36,000 neighborhoods), Census Tracts (43,000 neighborhoods), and Census Block Groups/Enumeration Districts (215,000 neighborhoods). These were given with the comparable sets of the 40 Clusters available to each.

Says Mac Nair, "The majority of PRIZM clients choose to work at a Zip Code level due to the ready availability of Zip Coded consumer data, and the resulting cost-effectiveness of this system.

"However, for certain specialized applications, such as site-location or direct-mail analysis, the smaller Tracts or Block Groups can be used for improved targeting efficiency," he adds.

Examples & Future Implications

Psychographics and demographics are terms that are so familiar within the inner sanctum of automotive marketing departments that they have become part of the lingo. Mention "psycho" or "demo" to almost any marketing manager or any sales promotion manager and he'll tell you what market group the company's new model is aimed at, and why.

For example, Nissan, in designing the new 300ZX, had to maintain a tradition to satisfy a loyal market group. Nissan hopes the new car will appeal not only to the "personal car" buyer, but to more males as well.

However, data on people who bought the 280ZX show that slightly fewer men bought the car than the market demographics would suggest.

One of AMC/Jeep/Renault's regional sales promotion managers, Rick Comfort, says that the new Diamond Editions Encore and Alliance are both cars targeted at "the more sophisticated, affluent, better-educated group between ages 18 and 49.

"In the upper age bracket," says Comfort, "the car is targeted at the young professional, both male and female. But, we are looking more toward the female car buyer with the sporty hatchback."

Now that most major companies have access to information, both "psycho" and "demo," they are finding more ways to target products and even predict the results, as Nissan is doing with the new Z car, and Renault with the Diamond Editions.

For 1985, Renault has moved up a step higher with the Alliance and has just introduced a convertible version of the car. And though the company only expects to sell 7000 to 8000 of the ragtops in 1985, it's clear that through the introduction of such up-market products, along with the rumored future debut of a larger family sedan and a mini-van, AMC/Renault is seeking entrance to a more affulent arena of buyers. Such marketing stragegy depends largely on market testing and the study of psychographics and demographics.

Trends Or Just Trendy?

"Psychographics and demographics are used to such a great extent today, and are focusing much more on the consumer because of the major trends taking place," explains Chase's O'Grady.

"Psychographics and demographics are both ways of looking at a market," he says. "However, people's impressions of them tend to 'swing' and this really doesn't make much sense.

"It shouldn't be a matter of 'jumping in' on either psychographics or demographics," he points out. "Taking the population and breaking it down to certain groups makes these both sound forms of research, but it is the combination of the two techniques that is useful."

Opinions about the value of either psychographics or demographics are always changing—one may be "in fashion" now, which, of course, is totally illogical, O'Grady says.

And in the future? O'Grady claims that other sound marketing approaches may be available. But, "advancements in technology would have to be made in order to devise something to replace [psychographics and demographics]," he concludes. ■

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World Automotive Outlook

by Thomas F. O'Grady

Although the less developed countries (LDCs) had a remarkable growth phase during the 1970s and will experience a still strong growth rate during the latter part of the 1980s, they will not become the major passenger car market that some observers have anticipated.

Clearly, many LDC government accelerated growth policies are now facing repercussions in terms of energy conservation, high inflation and large foreign debts. As a result, to combat their current troubles, the LDCs have adopted strategies of protectionism and wage reduction to reduce domestic demand for imports and help balance foreign trade.

In terms of auto purchases, the LDC share of total world passenger car demand is expected to increase by almost seven percent over the next five years, but actual new car registrations will reach a volume of only 7 million by 1990, accounting for less than 20% of the world market.

Even though the passenger car market in the LDCs will more than double in the next ten years—a much faster rate than that of the more developed countries (MDCs)—only 38% of the total net increase in demand volume will be in the LDCs.

Indeed, the major market over the next 10 years will remain in the MDCs, with 30 million new car registrations estimated for 1990. This is primarily due to the fact that the baby boom generation has matured and entered the MDC workforce and will become more productive as it gains job experience. Increased productivity, coupled with decreased labor force growth, will result in lower MDC unemployment and higher productivity. The decline in labor force growth and the aging of the baby boom workers will result in a fairly stable adult population, but a decline in the percentage of the population that is of working age (15-64). As this population ages and workers retire, the number of people of working age will decrease. This stable adult population represents the primary passenger car market in the MDCs.

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There will be slower automotive growth in the industrialized countries, however, as a result of the forthcoming decelerating growth of automobile density. For the most part countries with high densities in 1975, such as New Zealand, Canada and the United States, will exhibit much smaller growth increases than countries such as Italy, Switzerland and West Germany which had a relatively lower density in the same year.

Although average density is still growing moderately, the net addition to the MDCs' car park is decreasing.

This can be attributed to declining population growth in the industrialized countries. This slower population growth means that demand for automobiles in the MDCs will primarily become replacement demand for passenger cars already scrapped.

The oil price shocks of the 1970s have also taken their toll on the passenger car markets of the MDCs. More important, however, is the plight LDCs face in terms of energy.

In many LDCs, energy consumption parallels the level of industrialization. Nations dependent on imported oil are expected to have a more delayed motorization growth—attributable to the political curtailing of domestic demand—as they lessen the burden of the debts that such vulnerability brings about.

Passenger Car Demand

Industrialized Vs. Developing Countries (Millions)

	Indust.	**devel.**
1980	23.6	3.4
1985	27.1	5.6
1990	30.0	7.3

Even the oil producing nations must adjust their economies by leaning toward more labor-intensive industries to reduce unemployment, redistribute income, and subsequently, boost domestic demand.

During the 1970s, the LDCs exhibited a healthy import demand for MDC products, increasing their share of world exports from 19.5% in 1973 to 26.3% in 1983. However, the substantial debt burdens accumulated by the non-oil exporting developing nations to finance import purchases has caused an international financial crises, and the availability of loans to pay for future purchases is very uncertain.

On the export side, the LDCs face increased protectionist policies from the industrialized nations. Indeed, European nations have sought rollbacks and slower future growth rates for imports of textiles from LDC suppliers, and the US Government has also tightened controls in these areas.

The US has also experienced a buildup of sentiment against imports of processed raw materials and goods produced on the basis of artificially cheap energy and official incentives; policies that are prevalent among developing nations. The implementation of such actions by the MDCs could induce countermeasures by the developing nations, which would further restrict trade flows.

As the world emerges from the current recession, protectionism will undoubtedly become more common.

With all nations trying to reduce imports and increase exports simultaneously, market conditions will become distorted and international trade could be stifled. In fact, the collective global effect of widespread efforts to limit trade and boost domestic content could even lead to world economic contraction. Corporate planning must be broadened to include alternate scenarios of world market conditions. As this occurs, in conjunction with the shift of labor-intensive industry toward the LDCs, world trade should improve by the 1990s. ■